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THE IRON TRADE REVIEW

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Security of World Demands German Iron and Steel Industry be Kept in Check

BY C. J. STARK

ON that day in August, 1914, when the Krupp guns battered down the fortresses of Liege and Namur, the modern German iron and steel industry became the scourge of civilization. That industry, truly great by virtue of size and development, through these acts signalized to the world its dishonor. Its large output, capable of notable service in the advancement of human comfort and security had been turned aside to ignoble ends and to the despoliation of humanity. During the past four and one-half years that industry has represented the most menacing weapon of a people gone mad with dreams of worldpower and self-intoxicated with a delusion of inherent superiority.

The German iron and steel industry for 47 years has lived a false career. It was founded upon a national crime and in the end it has proved true to its heritage. When by the terms of the infamous treaty of Frankfort Germany came into possession of a large part of the great iron ore lands of Lorraine, she sowed the seeds which destroyed her soul and finally emboldened her in 1914 to cast honor and virtue to the winds.

By imposing her harsh terms in 1871 she robbed France of mineral wealth, the value of which even she in her thirst for territory and for what it would bring to her, was not to learn until some years later. Destiny ruled Germany was to commit two great errors of national policy—one of ignorance in 1871 but for which she might have fortified her industrial future and successfully have defied all forces of justice; the other of deliberate perfidy in 1914, when she attempted to wrest from France the iron ore wealth she years before, unwittingly, had not seized from her defenseless adversary.

The restoration to France of the stolen iron ore lands of Lorraine means peace and security for the world at large. It deprives Germany of the possession of three-fourths of the natural resources by which since 1900 she was enabled to build up her iron and steel industry from 8,500,000 tons to over 19,000,000 tons annually. Stripped of the iron ore of Lorraine and based upon the known deposits within her own borders, her future as the great industrial state of Europe will remain in doubt. Without a comparable iron and steel industry it is a question whether she will be able to sustain her present development as a manufacturing nation. The determination of that question manifestly lies in the hands of the allied nations. As they are willing that Germany shall receive raw materials particularly iron ore from themselves and from the outside world, so shall her strength and hence the effectiveness of her hostility be regulated.

A police power over the industrial Germany of the future automatically will result from this control of raw material. This must be enforced carefully and rigidly, if the world is to be spared from again enduring its great woes of the past few years. The high duty that the Versailles peace conference must discharge toward all nations is clear.

At the beginning of a new era of the iron and steel industry of the world, a completely changed lineup of actual and potential competition confronts the United States. Great Britain is stronger, France has unlimited promise, Belgium will be restored to a vigorous condition. This means much competition, but competition of the decent, straightforward kind in the world's markets, for the works of this country. A dishonored, discredited Germany probably has been eliminated. Its shadow must not be allowed to reappear to disturb these wholesome relationships of trade. Germany stole her way into the opportunity to threaten the world. She must never be given the chance to repeat the attempt. The greatest boon to the safety and mutual good will of all peoples is that the German iron and steel industry of the future shall be kept within reasonable bounds.

Peace Catches America Unprepared

Same Lack of Constructive Planning Which Marked Entry Into War, Now Appears in Country's Efforts to Meet Restored Trade Conditions Throughout the World—Commercial Policies Laid Aside While Fighting Raged

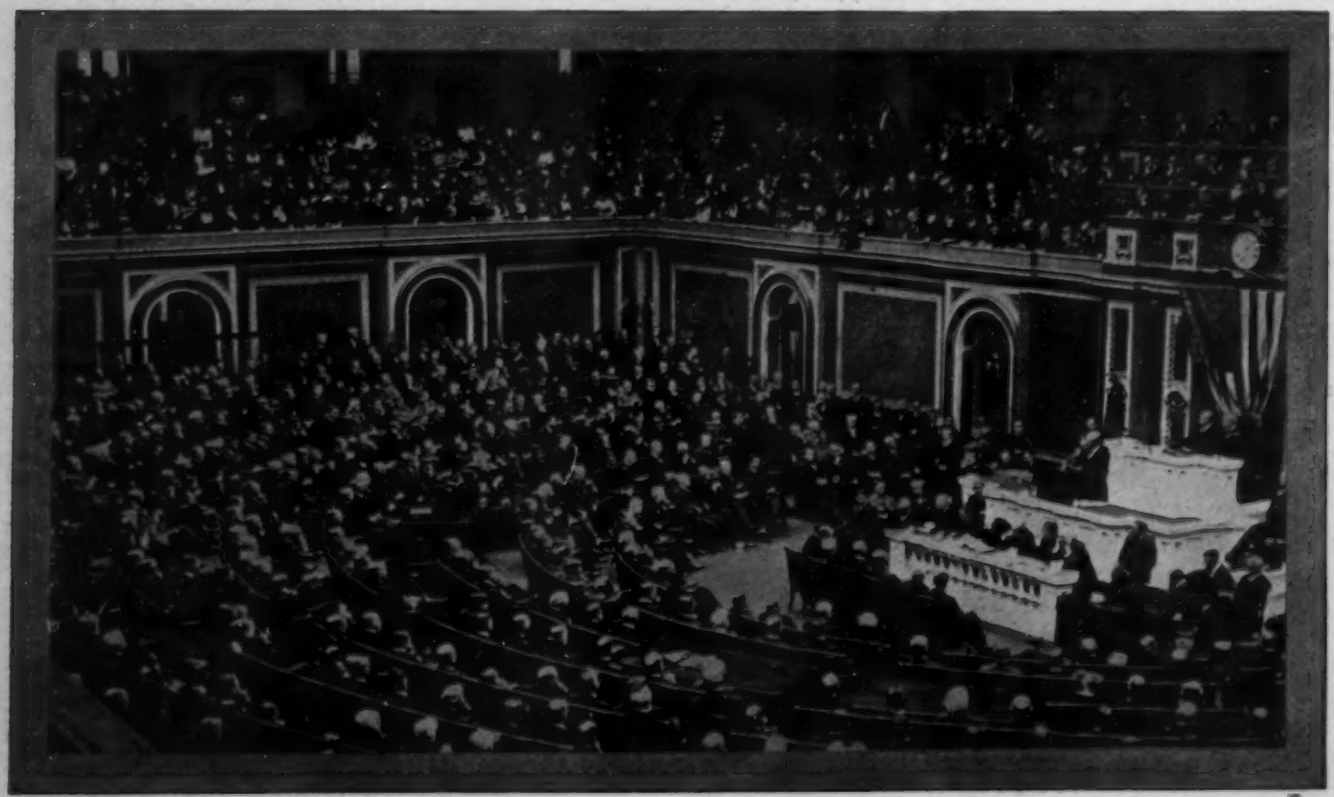
BY V. G. IDEN

AMERICA has started upon the period of reconstruction, actuated by the same altruistic spirit that swept her into the great European struggle. Wholly unprepared in 1917 the business men of the country arose, mobilized and voluntarily lent their aid which made a mighty military effort possible while congress talked, debated, discussed and finally legislated. The reconstruction period has started under similar conditions. War boards and executive bodies in Washington are gradually being disbanded, some of the authorities being transferred to the old departments of the government while others are being relinquished entirely. President Wilson asked congress to consider seriously the problems of reconstruction, especially what shall be done with the railroads, then went to France to attend the peace conference. Congress repays by starting to criticise the President for leaving the country, initiating fresh political disputes.

Those business men who had been instrumental in the mobilization period and in the co-ordination of industrial effort during the war hastened to meet in Atlantic City early in December to make recommendations for reconstruction. This convention was called under the auspices of the Chamber of Commerce of the United States, and nearly 5000 representative business men attended. They drafted their recommendations and departed home determined to wait no longer but intending to work out their individual problems of reconstruction the best they could. In the meantime the proposals to make permanent the benefits of co-operative effort, which were instituted during the period of the war, were sent on to congress.

Legislative wheels turn much slower in times of peace and it is not unusual to see a year or so pass before a particular measure is put through congress and an executive power delegated. It was such experience as this which prompted a popular call upon the government at Washington to make a start several months ago. This appeal had some effect as evidenced by the measures introduced in the senate and the house of representatives. The bills for the appointment of a reconstruction committee gave rise to some political discussion, while the opportunity to formulate real constructive plans for the period of transition was retained by the various executive bodies already existing.

The problems of demobilization are different although not entirely separate from the problems of reconstruction. War contracts are the immediate concern of demobilization, while labor is second in importance. The manner in which labor is to be treated during the period of demobilization, however, is of vital concern to the period of reconstruction. Immediate cancellation of war contracts would have a serious tem-



BEFORE LEAVING FOR THE PEACE CONFERENCE PRESIDENT WILSON REQUESTED CONGRESS TO STUDY THE IMMEDIATE PROBLEMS OF INDUSTRIAL RECONSTRUCTION. THERE ARE AS MANY IDEAS ON THIS SUBJECT IN THE LEGISLATIVE BODY AS THERE ARE MEMBERS

porary effect upon American industries, whereas if the United States is to subscribe to the demands of labor leaders and hold up wages and restrict the hours of labor it would require many years to normalize the results.

During the period of demobilization, if the beginning is any indication of what is to be done finally, the United States will pattern after England and the remainder of the allies. To withdraw men from the military service by industries and return them to civil life only so rapidly as industries can make use of them was evidently planned in the interest of political safety. It would be suicidal for the Democratic party to permit hard times to come to the laboring man prior to the presidential elections of 1920.

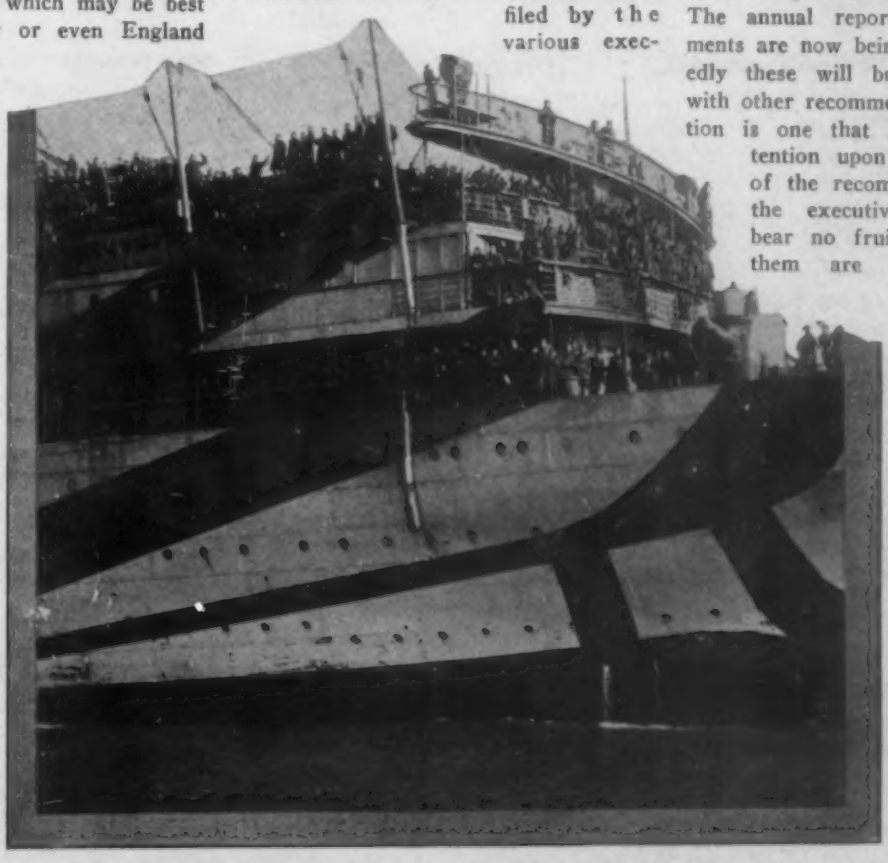
Reconstruction, on the other hand, involves the more permanent policies for which Washington officials have been seriously criticized because they have made so little preparation to cope with them. The European belligerents have made extensive plans for molding their reconstruction policies. Peace economics, it is realized, may not apply to war conditions, and neither will the prewar peace conditions be similar to the post-war conditions. This is a thing which many members of congress appear incapable of realizing. Not only this, but the policies which may be best adapted to Germany or even England are not the policies which would work well in the United States. If America's reconstruction is to be worked out upon a basis of permanent benefit to the people of the United States, it must not of a necessity be patterned after England, Germany or any of the Europeans. This is a viewpoint which few members of congress have grasped as yet. Inasmuch as congress has so far failed to rise to the occasion, the suspicion prevailing in Washington is that the reconstruction problems will be worked out upon the recommendations filed by the various executive bodies of the government. Except for the co-ordination of these recommendations filed by the various executive bodies of the government. Except for the co-ordination of the recommendations through the council of national defense which still exists although it has been extremely quiet for the past several months, legislation on labor, industry, transportation and foreign trade promises to be a sad piece of patchwork.

What of the Future?

NOW that the war is over, what will the government do to conserve American business interests? This is the all-important question of the hour, paramount to every other consideration in this transition period, and the question is yet to be answered by definite, constructive planning. One congressman points out that no one can forecast the lines that the common endeavor will take but that there will be co-operation and united effort at Washington to aid American industries. Another authority says politics has again come to the fore and that it is likely to permeate and retard legislation. The new congress is expected to heed the advice of sound-thinking business men who aided the government through the critical period of the war. The hope is expressed that they will not resign from the various governmental organizations before congress has time to formulate a definite program for the future.

Measure after measure was put through congress after April, 1917, without debate and therefore without delay, merely because the war emergency demanded it. Appropriations in the billions were approved without consideration by more than a mere handful of members. Enormous powers were delegated to the President without question on the part of the greater portion of congress. This will not be repeated when reconstruction legislation is taken up, because reconstruction problems are to be considered domestic problems in which the free play of politics and of partisan expediency can be shown without fear of having the question of loyalty raised. Political squabbles are today breeding. The November elections, which gave the Republicans a majority in both the house and the senate, inspired demands from the progressives for more recognition on the committees of congress.

To congress seething with political dissensions as here promised, are going the recommendations of various executive departments of the government. The annual reports of these departments are now being filed and undoubtedly these will be supplemented later with other recommendations. The situation is one that naturally centers attention upon Washington. Many of the recommendations made by the executive departments will bear no fruit, and yet some of them are worthy of special thought. This is an opinion expressed by the chief of the bureau of foreign and domestic commerce, department of commerce: "The old objections to a government monopoly have lost some of their strength, partly on account of the recent tendencies toward combinations under private control, and also because of the anticipated need of industry and trade during the



THE FIRST SOLDIERS TO RETURN FROM EUROPE. IT IS NOT MERELY A QUESTION OF PROVIDING A JOB FOR THESE, BUT MORE PARTICULARLY THAT AMERICAN BUSINESS SHOULD OFFER THEM GREATER OPPORTUNITY

period of readjustment after the war, while the results of government control during the war may serve to disarm to some extent those who would otherwise be inclined to oppose the plan on the ground of inefficiency as an inevitable concomitant of government control. The movement toward greater government participation in business may also be regarded as a reflection of the anticipated increase in the political strength of the labor element as a result of the war."

Several years ago that would have been considered a dangerous admission and one that would have tended to spell the political ruin of the most influential man. But this view of government participation in business after the war is not shared solely by executives in Washington but is also entertained by members of the legislative branch of our federal government. Representative John J. Esch of Wisconsin, the ranking Republican member of the committee on interstate and foreign commerce of the house of representatives, wrote in response to an inquiry:

"The war more than any other fact in our history has made us realize that the government of the United States is not something distinct and remote but intimately concerns us; we make it what it is, it is *our* government. The taxes we pay and the sacrifices we make bring our government closer to us and we tolerate and even welcome its control in the confident hope that success will be ours. A large measure of the control now being exercised as a necessity of war will extend through the reconstruction period and some of this control should become permanent.

"Owing to the enormous debt which the war will entail and the inadequacy of our customary sources of revenue our government may have to do as some belligerents are already doing, monopolize and operate on its own account certain industries, using the profits to meet its expenditures. While many of our people may deprecate this paternalistic trend, believing in private initiative and the free play of economic forces, financial needs may compel its acceptance. Sir Albert Stanley, president of the English board of trade, recently declared that 'at the close of the war practically the whole of the trade and industrial activities of the country would in some form be controlled directly or indirectly.' I do not believe that we shall be driven to such an extremity.

"The position of organized labor in favor of government control and even ownership will have a material effect in shaping legislation during and after reconstruction. We all believe that our railroads and other interstate utilities will not return to their prewar status. Whatever of good present control has effected as to them, will and ought to be retained."

This is the way many of our government officials and legislative leaders are thinking, and these are the men who will have most to do with shaping reconstruction legislation for America. The problems of reconstruction are many, but there are few of outstanding importance. An executive body of some form is now in existence which exercises jurisdiction in those spheres and each is attempting to deal with reconstruction questions.

Power Behind the Merchant Navy

The shipping board, through the Emergency Fleet corporation, has progressed far with the building of a large merchant navy. Many and extensive shipbuilding yards have sprung up. Shipbuilding for government account, the board has promised, will continue, but a serious dissension threatens to break out any day as to whether the government shall continue to operate these ships during peace times.

The Webb law authorizes the combination of domestic producers to carry on foreign trade. The war checked the formation of such combinations, but since the signing of the armistice it is reported a score or more have started to organize. The independent steel producers afford one of the most noted cases. They are rapidly completing their plans for an export combination.

The federal reserve act provides for the establishment of branch banks in foreign countries. Many such branches were established prior to our entry into the war, and it is merely presumption to expect that the extension of foreign branch banking will continue after peace is declared.

A board of vocational education has been created which is working on problems that are at the base of reconstruction work. The war department is lending assistance in this, and the labor department is striving to solve some phases of the man-power question which will render the labor supply more mobile.

The bureau of standards, department of commerce, is concerned with scientific problems and research. The bureau is planning, for one thing, a standard foundry code. It is desirous of unifying industrial practices as well as commercial measures of quantity and quality. With the development of this work, it is believed, will follow the demand for the adoption of a system of certification for all goods going into foreign markets. The bureau of foreign and domestic commerce is supplementing this with practical commercial research in foreign countries and the agitation of greater interest in the results of these investigations on the part of domestic producers. The secretary of commerce hopes to extend the staff of commercial attaches and special agents in foreign fields.

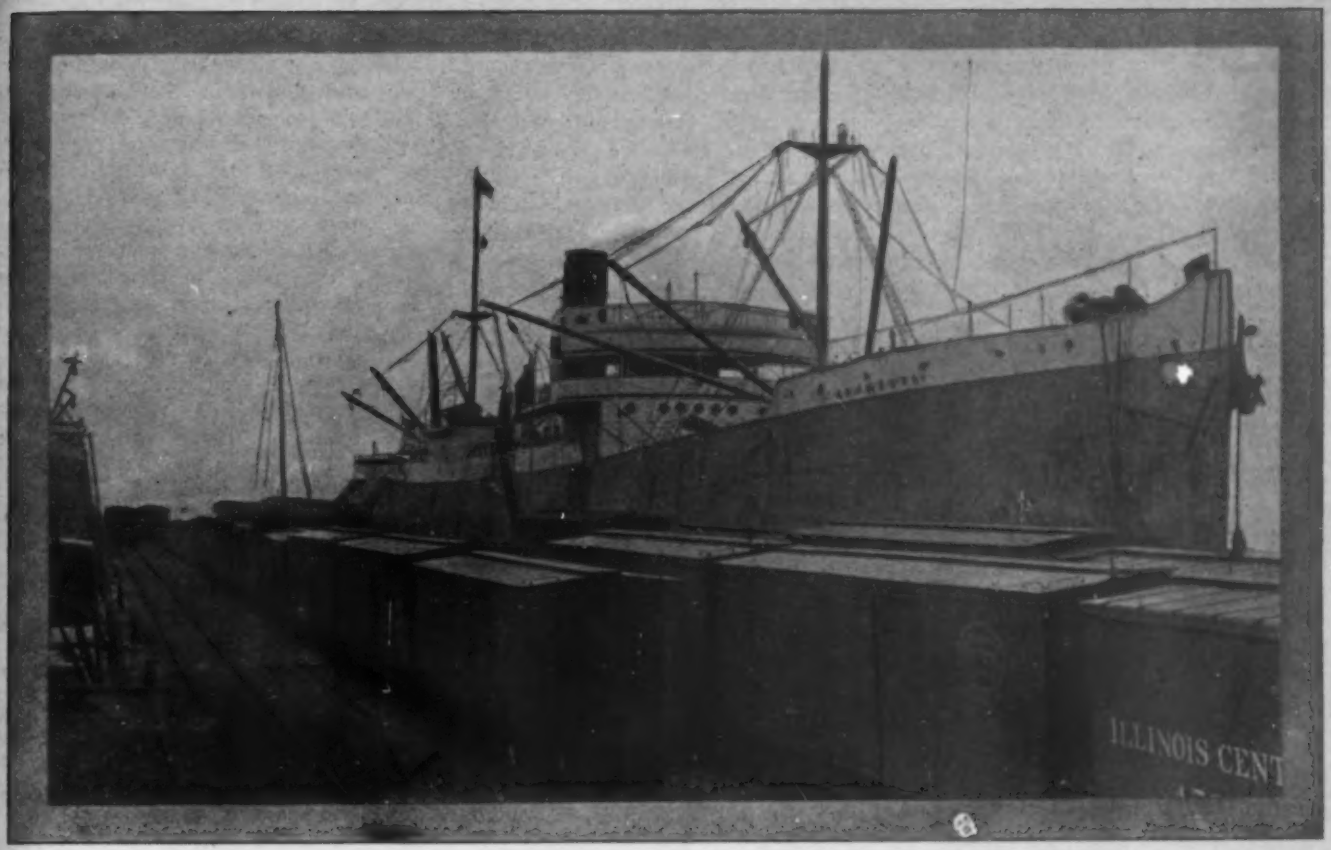
The state department has been striving to establish a more workmanlike foreign trade office. This department has also created a division on commercial treaties which has been collecting valuable information against the time of peace.

The tariff commission has been actively gathering information in regard to changes in commercial conditions brought about by the war and is ready to rush to congress with many recommendations. It was through the insistency of this commission that the dyestuffs tariff became an actuality, and now that the industry has been established in the United States the tariff commission has prepared a revision of the tariff on dyes in order to protect it from German competition after the war.

These mere beginnings toward solving the reconstruction problems are not greatly different from the small beginnings made for war before the United States was actually forced into a state of belligerency. In the national defense act which was put through congress the year before we went to war, a provision was inserted creating the council of national defense. This council was composed of certain cabinet officers whose work would be especially important should the country be placed upon a war basis. This council met and created, before we went to war, the advisory commission which still exists and which, when peace is declared, will aid materially in the reconstruction plans.

Little has been heard of this advisory commission after the war industries board, which was originally a part of it, was separated and made a distinct organization. But the commission has been going along quietly, making its own investigations into industrial matters. With peace here and the necessity apparent this commission should come forth practically the sole preparation for war. It may yet be our sole preparedness for peace.

Prior to the entry of the United States into the war much was being said in regard to the Paris economic conference. Members of congress bitterly opposed the signing of any economic agreement then primarily because it was feared the effect would be detrimental to the best commercial interests of the



TO MAINTAIN PROSPERITY AMERICA MUST LOOK TO HER FOREIGN TRADE. THE EXPANDING VOLUME OF THIS COMMERCE DEMANDS NOT ONLY RAIL AND WATER TRANSPORTATION FACILITIES, BUT ALSO EFFICIENT PORT MACHINERY

United States. Measures calculated to cut Germany and the central powers off from sources of raw materials, to give preference to the allied countries, appeared reprehensible to the members of congress. The economic rights of trading, which will undoubtedly include the methods of tariffs, will most likely be determined at the peace conference. Details of application will be left to each individual country. England was a free trade country before the war but has felt compelled to impose certain import duties to raise a revenue for war.

Representative Rainey of Illinois was asked by THE IRON TRADE REVIEW to give his opinion upon this subject. His reply was most pertinent to this very subject of the tariff. He said:

"Reconstruction problems will be as serious almost as the problems represented by the war. Our entire business system, foreign and domestic, will be absolutely changed. Our present tariff laws must be rewritten. The tariff laws now on the books were written to meet German competition. I have helped draw every tariff bill which has passed congress in the last eight years and have also been a conferee on all of them. We now have a nonpartisan tariff commission at work, appointed under a bill which I introduced myself, collecting data and preparing for the trade problems which will come up when the war is over.

"The question now is, not the home market, but how to preserve our recently developed enormous foreign markets. We have been exporting to every section of the world and have exported more manufactured products than any nation in the world ever exported before in similar periods of time. People are beginning to understand that a successful business man is not an enemy, and the time has passed when a member of congress can make a successful campaign by attacking the business interests of the country. The time has come when there must be a clear understanding between members of congress and representatives of the industries in the country."

That was the opinion expressed by the ranking Democratic member of the powerful ways and means committee of the house of representatives. It is believed that it is not greatly different from the opinion held by a majority of the members of that committee. This tariff commission, of which Mr. Rainey speaks, is headed by Dr. Taussig, who has declared for an open door policy in trade as in diplomacy. The door to world trade is to be opened as never before, and the American policy, he has said, should be a fair field with neither favors nor penalties. Our trade policy also should rest on ideals, and we should ourselves refrain from what we disapprove in others.

Considerable misapprehension has existed in regard to the foreign trade situation. Much of this, it is believed in Washington at least, has been fomented by German propagandists to create a distrust among the allies. The predominance of Japan in foreign trade and the great increase in our own imports from Japan have been selected as a point in case. In contradiction it has been pointed out that Japanese exports have expanded, as was bound to happen, and that more raw silk, tea and hat-making materials have been coming from Japan. The great bulk of what Japan sends here is either raw material or other products not otherwise obtainable. Besides this, the exports from the United States to Japan have far exceeded the imports from that country, as any examination of the official statistics will prove.

Another claim has been circulated with the apparent intent of creating distrust with England. The British purchased the Australasian wool clip. The prices paid were low as compared with those set in the United States. Immediately it was claimed that this was British trickery, that by getting their wool

cheaper they would be able to undersell Americans and others in woolen goods in foreign markets. And yet the United States government obtained British-owned wool at virtually the original prices. The French, the Italians and the Japanese obtained it on the same basis. Whatever may be said of the British trade aspirations, it cannot be denied but that they have played fair.

The war trade board which the government at Washington created to restrict imports and exports promises to play an important part in the reconstruction period. This board was originally created to prevent trading between our own citizens and the enemy. Its powers were broadened to restrict imports and exports that cargo space may be saved during the period of the shipping shortage. The board has been able to collect much valuable commercial and industrial information and the government will certainly not permit all of this to go to waste.

By participating in the war the United States has adopted some foreign policies which will have an important effect upon our reconstruction. Trade relations could not be promoted independently of the wishes of our erstwhile allies. The United States could not and would not invite Germans to engage in business here. The appointment of an alien property custodian has precluded this. Furthermore, this custodian has taken over all German investments in American industries and is selling them to the citizens of America. Prior to the war German investments in the iron and steel industry alone were extensive, whereas today none exist.

Purged of Enemy Influence

Many simon-pure Americans view the work of the alien property custodian and the war trade board with pride because through their efforts American business has been purged of enemy influence. Whether congress will be willing to draft legislation to keep this condition constant after the war is a matter for speculation.

Undoubtedly it would be inadvisable to continue many of the war boards and administrative bodies, even should congress seem disposed not to interfere with their being. On the other hand, the information gathered by these war bodies will afford a valuable basis for determining reconstruction problems. Inasmuch as reconstruction was being discussed during the first year we were in the war it should lend considerable hope. In 1917 the foreign trade advisor of the state department had collected and digested the plans of the British. In the spring of 1918 it was decided to separate the war industries board from the advisory commission of the council of national defense. That step was taken not primarily because Bernard M. Baruch desired to have a free hand and to have his organization independent. President Wilson himself expressed the idea in a letter which it is learned he wrote the advisory commission. It was desired then that the commission should be unhampered with administrative detail in prosecuting the war, but that it should be left free to keep close watch of industrial developments and make preparations for after-the-war conditions.

Thus the plans which were initiated more than a year ago were carried forward. The discussion came to a head again when a report was made in October last by the bureau of foreign and domestic commerce on reconstruction problems. Probably the most interesting part of this report dealt with the steps already taken by England. At one time the British had 140 committees, 6 commissioners, 4 ministries, 16 departments, 3 advisory boards and many more studying the problem. This activity on the part of the British had at that time already had its reaction. The imperial association of commerce was formed with the object of opposing the tendency toward excess in government management of what is better left to trade. Such a tendency on the part of our own government will certainly meet with opposition, as Senator Sherman of Illinois so logically points out.

Senator Sherman insists that legislation of a regulatory character "must be distinguished from the tendency for the government to substitute its own management or to seize an industry and operate it as a government enterprise."

"I believe," Senator Sherman continued in reply to a question, "in just regulation and not in government operation when peace returns. One is socialistic, the other is regulated individualism. A government of regulated individual enterprise and initiative is the wisest institution born of human experience."

The English political thought is undoubtedly for the preservation of individual endeavor and many excellent authorities in America hold that policy the best for the United States. Experiences during the war, especially in the question of price fixing, will, it is conceded, demand a greater exercise of the regulatory powers than would otherwise be the case. Prices on iron and steel and many other commodities have been fixed for the purpose of stabilizing the market and at the same time to bring out maximum production. With the passing of the war industries board fixed prices on coal and wheat alone will continue after the first of the year. The steel producers took the wise stand that price restrictions must be removed, and a readjustment and some reductions, in prices be made in order to hasten the restoration of normal conditions. So long as there is an inflated value of currency, however, no sudden unsettlement of the values of commodities can be permitted without facing the possibility of a great deal of trouble and financial ruin. The matter of adjusting wages alone is one which will call for the maximum of patience and consideration, coming as it does with a shifting of production from war needs to peace requirements. The war labor board and the war labor policies board are organizations which now are performing important after-the-war functions, although the policies of these boards must be altered somewhat to meet the changed conditions.

Declarations that labor has been selfish and that unions are greedy have not merely been heard among business executives, but also in the halls of congress. The reconstruction period must be so regulated, according to some of the leading political lights interviewed, that no bolshevikism or industrial chaos will result. At the same time it must be acknowledged that politicians are today keenly alive to that "new democracy" which is dawning and in which the present administration places such great faith. The only way in which to avoid chaos, especially in the matter of labor, it is said, must be co-operation on the part of the business interests.

"The government and business in the future," declared Senator Simmons of South Carolina, chairman of the senate finance committee, "will undoubtedly understand each other better than heretofore, and there should be and will be, on the part of the government, a more sympathetic and effective treatment of business. Business has been patriotic and on its part, I think, will be disposed to fully co-operate with government agencies."

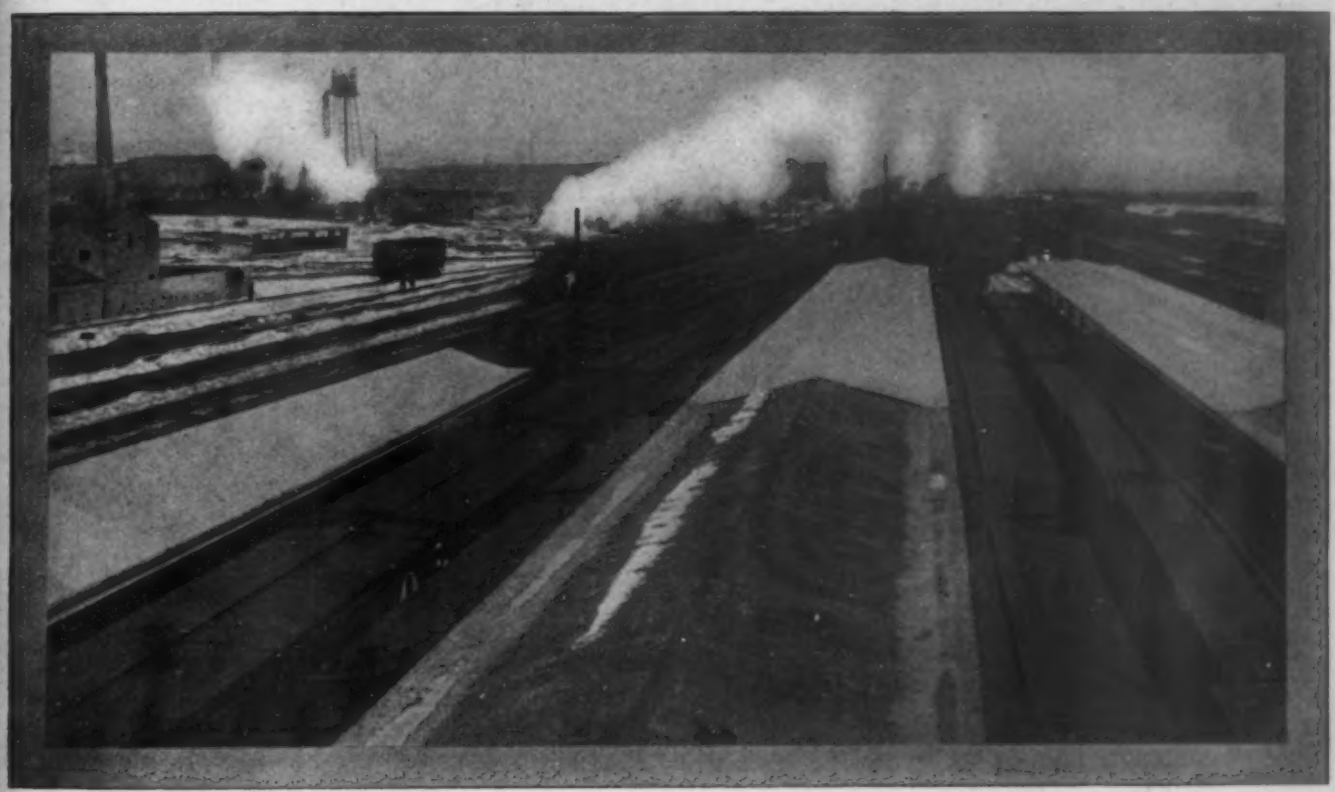
Confident of Co-operation

Representative Saunders of Virginia, one of the leading members of the committee on merchant marine and fisheries of the house of representatives, takes a more positive view of the situation.

"I have no doubt," he said, "but that the government and business men will work hand-in-hand for a common end. In fact, this has been the attitude of the government in the past, and any suggestions that a congress of representative Americans, many of them business men themselves, have had at any time any hostility toward business, or any

indisposition toward co-operation with business for a common end of general public advantage, has done a great injustice to the executive, and the legislative body.

"The real crux of this matter is not the willingness to co-operate (that I know has always existed), but it is the form that this co-operation should take. This will continue to be the real difficulty in the future. Certain things may be readily done during the stress of war, which may not be so readily undertaken when that stress is removed. I have no doubt that whatever is best to be done will be done, but no one can at this time forecast the lines that this common endeavor will take."



WHAT IS TO BE DONE WITH THE RAILROADS? A VITAL POINT IN ALL RECONSTRUCTION DISCUSSIONS. OBVIOUSLY IT WOULD BE WISE TO CONTINUE THE ECONOMIES OF CO-ORDINATION WORKED OUT UNDER GOVERNMENT CONTROL

The federal trade commission has played an important and at times a conspicuous part in the regulation of industries during war times. It was through this commission that the basic cost prices were at first investigated, and upon its recommendations the prices of iron and steel, of coal and other commodities were finally fixed. The commission then made an investigation of the meat packers, ostensibly for the purpose of finding out costs, which reminded the country of the days of "muckraking." The report of the commission in this instance called forth a strong protest from the Chamber of Commerce of the United States and from several members of congress. "In interstate commerce," said Senator Sherman, evidently with the report on the packers in mind, "I believe the government will exercise supervision over business transactions after peace comes more than in former years. The trade commission was created by congress as an advisory authority. It was believed both by the President and by congress that a tribunal to which men might appear in case of doubt was desirable. Such a body could make certain what was before uncertain. Every business man or person engaged in large affairs of interstate trade at times met the query of whether such a course could lawfully be adopted. The department of justice did not like to advise. Prosecuting attorneys in the several federal districts did not feel at liberty to do so since they might be called on to prosecute later covering the same subjects.

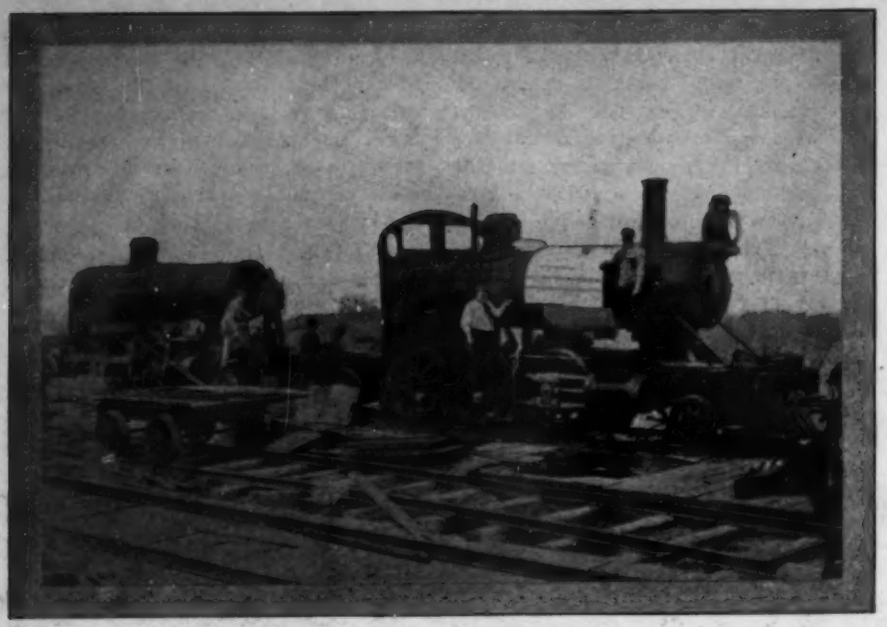
Criticizes Trade Commission

"In this dilemma business men contemplating what is a necessary combination could do no more than consult with lawyers and obtain private opinions as to the legality of the proposed undertaking. While the trade commission could not absolve them from the violation of the anti-trust laws it was believed that it would be a most useful agency in defining in co-operation with the department of justice what could be properly done. I believe the trade commission has departed from its intended theater of activity. It has become a perambulating inquisitorial body. It largely enters upon an investigation with hostile intent, not with any creative or preservative purpose. Its hearings are ex-parte and designed to establish a preconceived theory.

"A fair minded commission would be a genuine benefit to legitimate interstate business. It is more of a menace now than otherwise.

"I do not think it desirable for the government to undertake to maintain so large a measure of supervision and investigation of private business as is indispensable in war. Through the agency, however, of fair-minded members of the trade commission or other authority, their supervision can be of incalculable benefit in a larger measure of helpful influence over business."

The business men who attended the Atlantic City reconstruction convention voted to fill the vacancies on the trade commission with strong and broad-minded men alive to the benefits of reasonable co-operation between competition. They also favored a suspension or revision of the anti-trust laws that these benefits may be legalized and defined. None wished to go back to the old days of trust manipulation and neither do they wish to have forced on the country a period of harmful competition in domestic markets. While they favored a removal of gov-



AMERICAN LOCOMOTIVES BEING ERECTED AT DURAZNO, URUGUAY. ALL SOUTH AMERICA IS IN NEED OF TRANSPORTATION FACILITIES AND FACTORY EQUIPMENT. URUGUAY IS PLANNING AN EXTENSIVE STATE-OWNED RAILWAY SYSTEM

ernmental interference they wished to grant business that same measure of protection which the government now attempts to give the consumers of the country.

Practically every member of congress will acknowledge that the government authority over any particular line of business was assumed during the war period only where it was demonstrated that the private agencies would not alone accomplish the desired end. This was the principle upon which the Emergency Fleet corporation was organized. The government went into shipbuilding and the operation of merchant fleets because it was felt that private capital would not provide the tonnage necessary to meet the war requirements. For similar reasons the railroad administration was created and the government assumed control of the interstate carriers.

It may not be possible to permit immediately the resumption by private agencies of control over the transportation facilities. Certain changes in form and method of operation of such facilities will become permanently attached to them. Defects which have become apparent will be corrected, but economies and other factors tending to greater efficiency will be retained.

Government control over the means of transportation might be said to be concomitant to its control over foreign exchange, and, at home, over domestic credit. Some members of congress seem confident that such powers of the government will be extended during the period of reconstruction rather than restricted. The war finance corporation was originally created to extend credit to essential industries which found it difficult to obtain capital in the open market. No sooner had this corporation begun operations than it was proposed to amend the law so that capital could be loaned the less essential and the non-essential industries which were threatened with bankruptcy. While this corporation was intended to meet solely a war emergency its functions will not of a necessity cease with peace. The capital issues committee, which passes upon new issues of capital, is an adjunct to the corporation and both are allied to the federal reserve board. The functions exercised by these two bodies may not be extended in their entirety after the war, but their influence will, without doubt, be felt through the federal reserve system in some form or other.

"The doctrine of in union there is strength," declared Senator Owen of Oklahoma, chairman of the senate committee on banking and currency, "is more completely recognized now than ever before. I certainly believe that the government should continue to exercise its co-operative and aiding influence over business.

Suggested Government Control

"In the federal reserve act I demanded that the government should control the system, broadly co-operating with the banks and business people, as there provided, which in effect put the power of the government behind the sound credit of every individual business man engaged in commerce and production. This principle has demonstrated its value; it should be carried out in reconstruction with the greatest care, energy and foresight to the end that the prosperity of American business shall surpass all previous records."

Congress has delegated to the federal reserve board and the secretary of the treasury authority to regulate foreign exchange. This was done out of necessity because after America entered the war the exchange with neutrals was against us.

Many expedients have been resorted to with varying success. Restrictions on trading, credit loans and similar means have been tried for the purpose of bringing exchange back to par. It is conceded that the most tangible results would be through the extension of branch banks in foreign countries. This is an expedient some of the more prominent American banking institutions were resorting to when the war broke out. Whereas war conditions may not have offered many inducements to the extension of foreign branches, peace may renew the interest of bankers.

Carrying out Senator Owen's idea this growth in branch banking should be under government supervision and broadest co-operation. So long as American shipping is exclusively in the hands of the government this closer supervision will undoubtedly result in banking matters.

Because the government has created executive bodies with very definite powers to regulate industrial affairs during the war this must not be confused with permanent government policies. The war industries board, which was probably the mightiest of these organizations, the food administration and others pass out of existence automatically at a fixed date after the declaration of peace. The officials of these boards are volunteers serving without pay and appropriations for their clerical staffs are made from year to year.

Some persons of socialistic tendencies have expressed the opinion that inasmuch as the food administration has done such good work preventing increases in the cost of foodstuffs and justly distributing the available supplies, popular demand will be such that congress will feel compelled to continue this organization. That, however, is mere assumption. The law creating the railroad administration stipulates that the railroads must be turned back to their private owners 21 months after peace. A limit of five years is placed upon the life of the Emergency Fleet corporation. Naturally now that peace is in sight the fight over government ownership should spring up afresh.

It would, indeed be a calamity were congress to start out on its plans of reconstruction completely ignoring the factors which brought about industrial mobilization for war. The steel in-

dustry affords a single case in point. Acting through the American Iron & Steel institute, the industry has given a great service to the country. The advice of this same agency of the industry will certainly not be ignored by congress when reconstruction plans are taken up. Through the efforts of the Chamber of Commerce of the United States nearly 400 industrial committees were organized to advise the government during the war emergency. The prominence won by the industries in so doing must not be lost. It would not be good business for these industries to permit it.

Congress is naturally most interested in foreign trade. Some expediency must be resorted to for the purpose of assuring the fullest use of the vast fleet of merchant ships which the government has built and is building. Legislation designed to aid in the development, at this time, seems assured judging from views heard expressed. In this development of foreign markets no American industry will object. The Webb law, which was designed to remove all restrictions upon the organization of combinations of domestic industries to carry on foreign trade, was the first reconstruction measure enacted by congress. It was put through the senate in spite of the opposition of a majority because it was insisted that it was essential to the preservation of American commercial prominence. While it must be acknowledged that few combinations for foreign trade have been created under this law, the explanation is easy to find. The restrictions on trading during war times have been excessive, and the foreign demand for American goods so great as to eliminate all semblance of competition. Expediencies to promote trade, create markets or meet competition were not necessary.

With the cessation of war orders and the demobilization of some 10,000,000 soldiers, sailors and war workers, and the necessity to transfer the country from a war to peace basis with as little hardship as may be, American industries are confronted with the moral obligation of maintaining production. Only by maintaining production will jobs be provided for the vast army of men and women who have been serving in the military forces and in clerical capacities.

Americа has the advantage today in that she is a creditor nation. Prior to the war Europeans had billions of dollars invested in the United States. During the war we have purchased all these securities back and in addition have extended loans which approach a total of $8,000,000,000. Trade, it has been claimed, follows investments and if this holds true during the abnormal period of reconstruction there should be no fear of the lack of European markets. But for the funds and the interest on loans extended the Europeans it will be necessary to take payment in the form of imports from Europe.

Markets in neutral countries will not be so readily obtainable as many persons think. During the four years of the war the neutrals have been cut off from European sources of supplies, and for the most of that time have been unable to obtain goods from America. The lack of foreign sources has prompted the neutrals to find substitutes or to build up their own sources of supply. The war has, therefore, created competition for us in the erstwhile neutral markets.

Germany entertained an autocratic idea in regard to foreign trade. It was based upon the largest return to Germany. Her reconstruction plans, based on her expectation of victory, especially those relating to raw materials, were based upon similar economic ideas. The United States fought the war for an ideal, it remains to see whether it will be possible to fight peace for an ideal. Idealistic views in regard to the treatment of labor and of foreign trade are rife in Washington, but the country is at the mercy of politics, and can only petition for practical and safe reconstruction legislation. Individuals often hold safe views, but congressional action is difficult to obtain. It was after the armistice with Germany had been signed that congress finally passed the war-time prohibition bill. It was after the armistice that the postoffice department took over the cable lines as a war emergency. To a business man it is irksome to realize that the legislative wheels turn so slowly. The danger of the situation is that such delay will breed impatience among the numerous capable business executives whom the war called to Washington and prompt them to resign their trusts when their business counsel and judgment now is needed more than ever before congress has settled with the reconstruction problems.

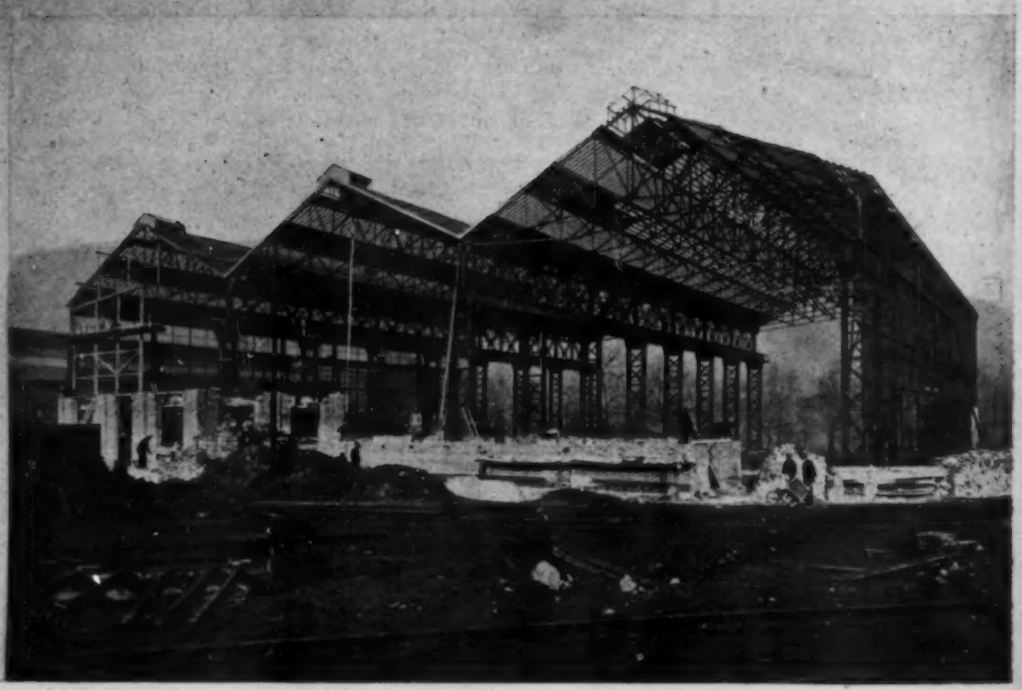
Bernard Baruch, Charles M. Schwab, Harry A. Garfield, and William G. McAdoo have resigned to return to private life. Other influential business men who have been important cogs in the war machinery in Washington are leaving. Had they remained throughout the reconstruction period, American business may have been better content with the outlook. Today they are inclined to the view that the combined results of individual endeavors must solve the important problems of restoration. To them and to the country the program in Washington is confusing to say the least. Conflicting views are held not only by members of congress but also by officials of the executive branch of the government. America is at the mercy of the Yankee ingenuity of individual citizens. Faith in the outcome arises from the fact that business men are today better informed of world conditions and of world opportunities than ever before. May that Yankee intelligence arise to the occasion!

TRAIN LOADED WITH AMERICAN STEEL AT RANGOON, INDIA, A SCENE UNHEARD OF PRIOR TO 1914. MANY MARKETS HAVE BEEN OPENED UP TO THE UNITED STATES WHICH ONLY NEED TO BE RETAINED

WOMEN AT WORK PREPARING STEEL FOR NEW CONSTRUCTION

REINFORCED CONCRETE SECTIONS READY FOR GENERAL USE

A NEW STEEL-FRAMED SHOP UNDER CONSTRUCTION IN MID-FRANCE



Unconquerable French Spirit Turns to Reconstruction

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The City of Lens After Four Years of Terrific Fighting

BY FRANCIS MILTOUN

French Correspondent of The Iron Trade Review

THERE is no finality in any estimate it is possible to make at this moment of the industrial and economic outlook in France. The future is replete with possibilities. Much depends upon the outside world; much depends upon France's allies and the United States; something depends upon neutral countries; and something depends upon Germany and just what may be the final political and economic attitude toward the central powers, as they were known before the war began, dismembered though they are today.

Reconstruction is now the aim of France as it is of all the civilized world. It is a word which embraces much, the conduct of life, the resources upon which life depends and the facilities which are to be offered for the resumption of industry in all its phases, from the labor of the peasants in the fields to the workman in the shops. One-fifteenth of the entire population of France has been left by the war without homes, and without a means of livelihood.

Rehabilitation Plans

The program for reconstruction and replacement is now being considered. On general lines, the ideas formulated by the French government in November give a suggestion. Monsieur Clementel, minister of commerce, appointed a commission which decided on the following classification pertaining to work to be accomplished in rebuilding and re-establishing factories:

Those completely destroyed.

Those difficult of being put back into working order.

Those of which there remains debris which can be reclaimed, with the possibility of their being restored or repaired.

Those which may be put in a working condition in a brief time.

Allied therewith is the question of *ravitaillement* of the population in all things, food and clothing for the numerous segregated groups, household necessities and tools of trade from farm machinery to that of factories. In the Lille-Roubaix-Tourcoing region there are half a million persons to be supplied, all of whom may be said to be producers of the very things that are produced nowhere else in the rhomboid of modern France. There are 100,000 more in the same class in the Douai-Valenciennes district, and 30,000 at Denain in the iron and steel industry, with as many more miners in the immediate region, whose labor is necessary to keep the furnaces in operation.

If ever the adage "make haste slowly" was pertinent it is in northern France, where all is devastation. With

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BRITISH ROYAL ENGINEERS REBUILDING THE FAMOUS MENIN ROAD WHICH HAD BEEN OBLITERATED BY BRITISH SHELLS

fragments that remain something can be knitted together but it is not possible to reconstruct a factory or a furnace of mere debris particularly if the larger part has been taken to serve other construction, gun platforms or dugouts, miles away from its original emplacement.

Where industrial establishments have been stripped of their tools and machinery the prospect is doubly depressing. All is to be built up anew. Where is the material to come from? It is not to be had in France, nor in England, and for the present America alone with its vast resources may not even supply all the raw materials which may be required at once.

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DEVASTATED RAILROAD LINES IN WAKE OF RETREATING HUNS. FRENCH RAILROADS FIGURE PROMINENTLY IN RECONSTRUCTION PLANS

Andre Tardieu, French high commissioner to the United States, recently voiced France's appeal to the United States. What will be the answer?

On Oct. 16, 1918, the allies had recovered 13,800 square miles of the 26,000 of French territory invaded by Germans in the first year of the war, and they had recovered 530 square miles of the 18,125 of Belgian territory taken by the enemy. It was estimated at that time that there remained more than 25,000 square miles in 10 former busy industrial provinces which required to be reconstructed "from the ground up" and repopulated before they could produce anew. There was practically no scrap material on the spot which could be used in summary fashion, although the iron ore production of the region before the war was 90 per cent of all produced in France, the pig iron production was 83 per cent, steel 70 per cent and electric power 45 per cent of the total.

Lille Victim of Vandalism

Lille, although suffering less in external appearance, had its sinews sapped to the limit. Where a flourishing textile industry existed there is little but a ruin left. The machinery was carried off to Germany. At Haubourdin, near Lille, was one of the most modern industrial plants in France, the admiration of the Germans from the first days of the occupation. Lille, be it remembered, suffered practically no damage from bombardment, for as a fortress it had been declassed and its munitions and armament removed to Dunkerque and Maubege, therefore, German vandalism found freer play.

This factory served a party of German engineers as a model, as they first made a precise plan of its machines, its layout and its operations. It seemed at first as though they were merely adopting an idea for use in their industrial world at home. The illusion was soon dispelled for the entire equipment was dismantled, packed up and sent away across the Rhine. And then followed the structure itself, truss by truss, brick by brick, transported on a special train which had been backed up on the siding, transported *outre-rhin*, whither no one knows.

At Rheims, where there was a flourishing woolen industry, an automobile factory and car works, German shells did the damage German hands never got a chance to do. Amiens suffered least of all, although its industry was stopped for months, and there some sort of industrial activity can be well under way soon. With all the iron and coal mining regions so long under enemy control it is too soon to estimate what their output may be. Bethune, Lens, Douai, Denain and Anzin were all razed. Two years is the estimated time required to put the coal mines of northern France in operation.

Government to Supervise Buying

The future affecting the equipment of French factories of all kinds making use of machine tools has undergone a revolution which unquestionably will be in force for some time to come. On Oct. 29 a ministerial decision made it known that "until further notice" all demands for machine tool equipment, whether purchased through importers, or through

ANDRE TARDIEU
French High Commissioner to the United States

French manufacturers or agents, must go through a government bureau, which would thus be able to secure the proper distribution in quarters where the production of factories could be made to best meet the national need. The "Inspection Forges" takes upon itself the authority for delivery of raw materials required by French constructors of machinery, alloting pro rata appropriate percentages of various metals to various industries.

The wholesale distribution of certain classes of other forms of machinery—cranes, windlasses, scales, trolleys and motors, etc., is abolished under the same ruling, and those who may have stocks of this equipment will be obliged to declare them to the central bureau. In general this applies to all specialties in metal of a value of more than the equivalent of $100. None is to be delivered to purchasers unless the latter presents a requisition properly signed by the French authorities, and all sales so made are to be recorded in special registers which will be turned in periodically to the government for *visas*.

Doubtlesss, in its entirety, this is a temporary measure, but in spite of the approaching peace treaty, the necessity of its application remains. Dealers who do not conform to the requirements of the government will be deprived of the right of further importation of raw materials for their industry in favor of those who rigorously observe the regulations.

At present the new plan simplifies the priority regime which has been in operation during the last months of the war to the extent that a manufacturer in France may specify his need as to quality and price when the commodity in question will be ordered for him in an allied or neutral country under a group system, bearing in mind also freight facilities which may be available at the time or within a certain prescribed time limit.

Collective Orders

A special ruling affects all iron and steel and provides that any group of individuals or associations may place its collective order through the proper bureau when orders will ultimately be passed on to the prime source of the raw material in question. It is not meant to be inferred that the United States will have a monopoly of these orders but rather that in so far as the United States may be able to fill them there are unquestioned economic reasons as to why it might be a politic thing to place them there.

The names of the various bureaus where these orders are to be centralized in Paris are as follows:

Comptoir d'Exportation des Produits Metallurgiques. (Iron, steel and tin, United States and England.)

Consortium des Marchands de Fer. (Iron and steel for the consortium, United States.)

Groupment des Constructeurs des Chandieres. (Plates, tubes and profiles for boilers, United States.)

Comité des Houillères de France. (Mining machinery, United States.)

Comptoir d'Achat des Etireurs de France. (Steel for wire drawing and the like, United States.)

Comptoir d'achat des Trefiliers de France. (Steel wire, United States.)

Groupment de la Boulonnerie. (Iron and steel for bolts, United States.)

Groupment des Fabricants des Fers a Cheval. (Metals for horseshoes and nails, United States.)

Groupment des Constructeurs Electriciens. (Steel for dynamos, bronzes for brushes, etc., United States.)

Groupment des Fabricants des Limes. (All file products, England.)

Consortium des Constructeurs de Machines Agricoles. (Metals for agricultural machinery, United States.)

Groupment de Motoculture. (Metals for tractors and parts thereof, United States.)

Comptoir de Repartition des Tubes. (Iron and steel tubes, United States.)

Comptoir des Tubes pour Avions. (Tubing for aeroplane use, United States.)

Groupment des Etireurs pour Tubes d'Acier. (Raw material for tube manufacture, United States.)

Comité des Forges de France. (Pig iron, England.)

Société Minerai et Metaux. (Lead, United States and Spain.)

Société de Nickel. (Nickel, United States.)

Groupment des Importeurs d'Amiante. (Asbestos, United States and Canada.)

Groupment des Consommateurs de Manganese. (Manganese ores, all countries.)

Société Aluminum Francaise. (Aluminum, all countries.)

Comptoir Francais de Ferrosilicum. (Ferrosilicon, all countries.)

Comptoir Francaise de Ferrotungsten. (Tungsten and molybdenum, all countries.)

Compagnie des Forges et Acieries Electriques. (Ferrotitanium and ferrovanadium, all countries.)

Société des Producteurs de Carbure de Calcium. (Calcium carbide, all countries.)

Comptoir des Importateurs des Huiles-minerales de Graissage. (Mineral oils and greases, all countries.)

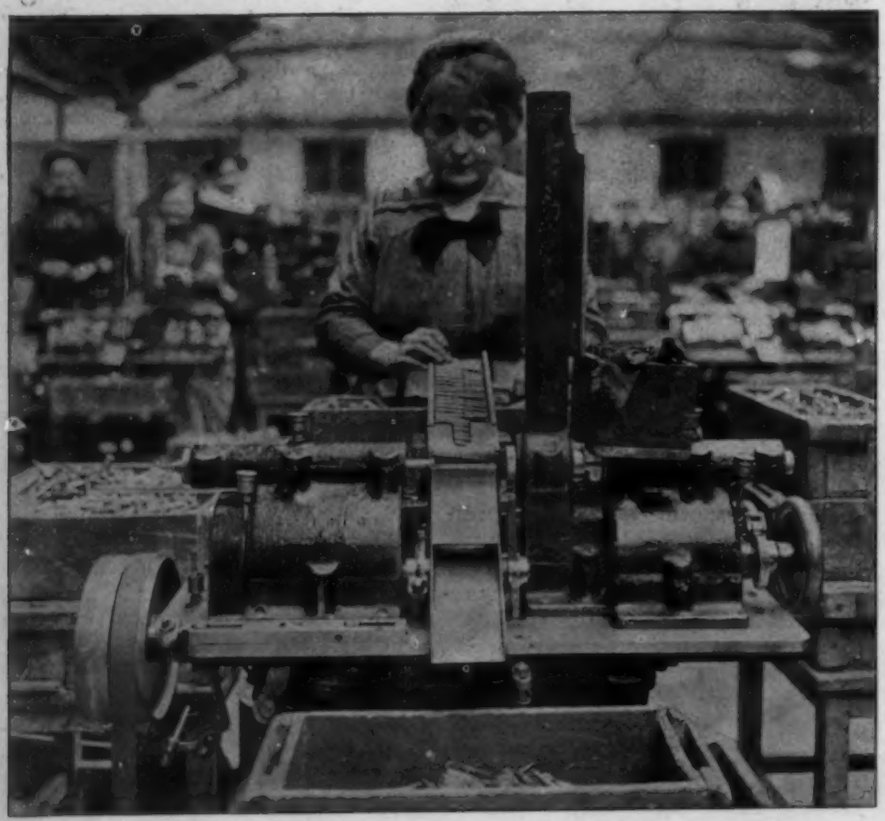
Comptoir d'Achat Machines-outils. (Machine tools, all tools and factory materials, United States, Switzerland and England.)

Comptoir d'Achat des Fils, Pointes et Clous (in formation). (Wire, tacks and nails, all countries.)

Chambre de Compensation de Carbure (in formation). (Calcium carbide, all countries.)

Lord Northcliffe in an article on the after-the-war program for France has summarized the situation concisely. In part his article, which has recently been widely distributed in France, is as follows:

"We have to consider that hostilities have brought about a conspicuous shortage of foodstuffs and raiment, of means of transport and of raw material. The mechanism which regulated all these issues for the period of the war will perforce have to be kept in movement during the period of reconstruction. This is a universal problem which will have to be solved, and which can be solved only upon a universal basis, and what transformations may be necessary may well be relegated to such occasions as present themselves, when we shall be obliged to transform these economic relations which have been imposed upon us according to necessity and a liberal interpretation of the views of one and all in the various classes of society."



THE FRENCH WOMAN AMMUNITION WORKER WHO LOOKS FOR A CONTINUANCE IN SOME RELATED INDUSTRY

Demand Germany Aid

Delegates from all the French chambers of commerce met in Paris recently. Seventy-nine were present, among them delegates from the newly reoccupied cities of northern France, Lille, Armentières, Roubaix, Tourcoing, Saint Quentin and Valenciennes. Resolutions were passed praying the authorities in the coming peace terms to take into consideration the needs of French industry which had been affected by war. Four distinct clauses of this manifesto stand out above all others:

Germany should be compelled to furnish raw material and labor necessary for the reconstitution of the dead industries of northern France.

To assure the necessary ravitaillement for this reconstitution Germany should be compelled to turn back at once the equivalent of all the railway rolling stock which she absorbed at the time of her invasion.

To assure the working population a roof over their heads, clothing, furniture and tools with which to earn a livelihood arrangements should be made to furnish such under government control on more favorable conditions than could be had in the general trade.

Should German-made material or equipment be used in French industry a policy of replacement by French equipment should be begun, and thus furnish an effective check to any attempt at a peaceful penetration by German manufacturers.

France Richest in Iron

Among the greatest problems now confronting France is the re-establishment of the metallurgical industries. Not only must this task be achieved, but France must take into consideration the extension of her industries by reason of her acquisition of Alsace-Lorraine. How to utilize all these vast new resources to the best advantage is claiming the attention of some of her brightest minds.

France, without doubt, is the country of Europe with the richest possessions of iron ore. After the statistics presented at the Stockholm congress the basin of French Lorraine was known to have 3,000,000,000 tons of iron ore in sight. To these must be added today the later developments of the basins of Normandy and

Anjou, each of them much more considerable than was supposed a few years ago.

To the mines of Briey will be added those of Lorraine. The ore of Meurthe et Moselle is not characterized by a high percentage of iron, giving but 32 to 38 per cent of metal, although it is economically worked.

Rich in phosphorus, the Briey mineral remained practically unexploited until the end of the last century from the fact that metallurgical workmen had not arrived at the competence of removing this impurity with facility, which the later popularization of the Thomas process rendered possible. The modern utilization of ores containing phosphorus gave the minerals of Lorraine their value and led many French industrial metallurgists to the region. It was in the east, just previous to the opening of hostilities, that the most productive iron and steel plants of France were to be found. Homecourt, Licheville, Longwy and Joeuf figured at the head of the list of the French metallurgic industry.

The Tragedy of Denain

Here is a shocking example of German vandalism which typifies the whole industrial situation of northern France. Denain was one of the busiest metallurgic centers of the district. It has little history save that the Maréchal Villars won a decisive victory over Prince Eugene in 1712 which led to the end of the Wars of the Spanish Succession. The rest is allied with industry from a remote date. The city is the "twin" of Valenciennes, one of the walled towns of France which has the right to wear a castellated tower on its armorial. Valenciennes is aristocratic, Denain is of the earth.

Denain is the center of the mining regions of the north of France in which were produced one-half of all the coal in France in ante-bellum days. The recent deliverance of the great industrial centers of the north has revealed the full measure of the horror of the German invasion and its attendant pillage and systematic destruction. The Société de Denain-Anzin had two groups of plants, that of Denain being by far the most important. Denain had on the eve of war a complete metallurgic cycle of six furnaces of recent construction, a complete steel plant for operating under the Thomas process, with four converters, a Martin plant of eight ovens and a series of rolling mills specializing in the fabrication of plates. Denain-Anzin being at the time the largest producer of plates in France. The combined plants also produced the biggest tonnage of Martin steel.

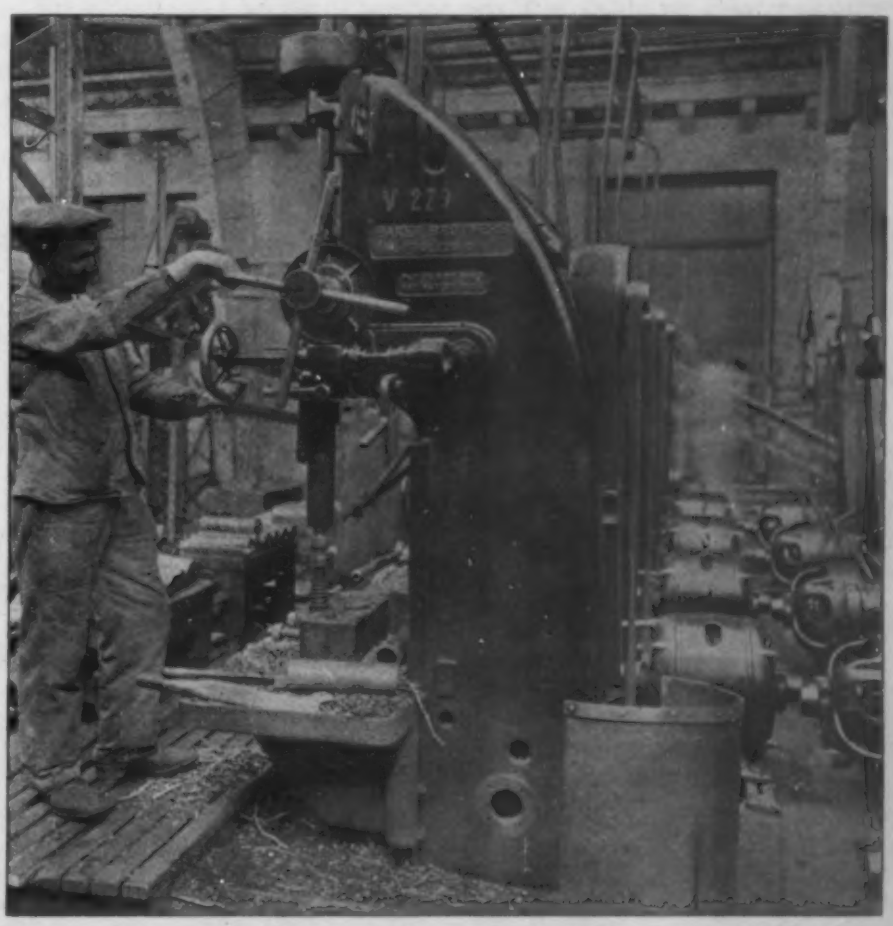
The Forges de Denain-Anzin covered an area about four miles long and more than a mile wide. The annual production exceeded 350,000 tons. More than 25,000 men were employed in the plant. It was a big, work-a-day civic and industrial center, with the accompanying roar of machinery and spurt of flame apparent for miles around. Its prodigious activities did not cease night or day. From the plant there went forth thousands of miles of rails, hundreds of locomotives, acres of steel plates. Today it is a junk heap.

In September, 1914, the director, because of a lack of workmen, had shut down the plant, when a German officer arrived, demanded any stocks of iron or steel which might be on hand and insisted that the director put the plant at once into operation. The director had no recourse but to refuse; he lacked entirely the necessary workers and raw material. Production was impossible. Successively came other visitors, who, simulating surprise, proposed to produce, from some magic source, raw material and a staff of workers. The director refused to consider the proposition. The Germans became menacing. Finally great placards were posted on the walls announcing its sequestration by the German authorities.

Came one, Captain Bocking, a German officer, an iron and steel operator from across the Rhine. He proceeded to have a minute inventory made by German workmen and Russian prisoners who proceeded to make ready for shipment all the finished and semi-finished stocks. It was but a step from this to attacking the plant itself; crucibles, rolls and molds were removed and what could not be carried off was destroyed. The actual razing of the plant was then in full swing, on orders received from the department of demolitions.

Kultured Looting

Higher up it was decided that the demolition was taking place altogether too slowly. A former foreman of German nationality who had been employed in the steel works of Homecourt on the edge of the Basin of Briey, by the name of Dryer, attacked the job with a zeal which was effective if unworthy. He got together in a short space of time 80 tons of bronze bushings, steel rolls, chassis and machinery and all were shipped to various competitors in Ger-



AMERICAN-BUILT MACHINE TOOLS AND MOTORS WILL PLAY AN IMPORTANT PART IN FRENCH RECONSTRUCTION AS THEY DID IN WAR

ELECTRIC DRILLS MADE IN AMERICA ARE USED IN FRENCH SHIPYARDS

many, whose names are known and are on record.

Soon after 400 wreckers burned and blew up with dynamite all that remained. In one day there were 60 great explosions. Said Monsieur Woerth, the administrator who took the first French authorities over the ground after the reoccupation: "Each explosion made me shriek with rage. You see they have left nothing. The Forges de Denain can not be set to work again short of 10 years."

American Machinery Needed

In view of the armistice which is actually in operation it is perhaps a dead issue to discuss Germany's objects of the war, but the fact is these same issues have a great bearing on the future of France, above all in that which concerns the metal industries in all their phases. Germany's purpose will never be forgotten.

At this distance from the outbreak of hostilities, when the German fabric has crumpled on all sides, we may well believe that Germany's object of the war was world trade dominion. Largely, in so far as it applied to France, and in so far as the layout of the whole world of industry is concerned, it is permissible to hark back to the statement made just after the first battles of the Marne and the Yser, by the German chancellor of the time, to the Industrial and Agricultural Allied associations of the empire.

In brief this is it:

"To develop the riches of Germany in iron and coal products our project must be to annex the regions of Briey and Longwy in Meurthe et Moselle and the coal regions of the Pas de Calais, the Nord and Belgium. Big and little agricultural properties in these territories will pass into the hands of German settlers and France will arrange as best she can with those of her race who may have been dispossessed in order to locate them elsewhere."

The thing is monstrous, it is incomprehensible, but it is on record.

Herr Dernburg, in the American press, after the battle of Charleroi, when he made known that Germany would take possession of the whole territory whose frontier ran perpendicular to a line drawn from Saint Valery to Lyons in mid-France, including all east thereof, was hardly more preposterous in his claims.

Only on the last of October of the present year there appeared in the German press an article, which ultimately found its way into France, concerning the liquidation of the famous Wendel iron plants of Lorraine. Of Germano-Lorraine conception, in order to fully meet the conditions of the treaty of Frankfort, this ancient property was made into a stock company called "Les Petits-Fils de Francois de Wendel." This was in 1872. As such it has been operating ever since, but under German rule. Its stock amounted to 32,000,000 francs, and its various plants were situated at Hayange and Moyeuvre in Lorraine, with coal exploitations at Petite Rosselle in Lorraine and at Hamm in Westphalia. The part which had remained French of the patrimony of this old house of Wendel was founded in 1704, and is owned by Wendel et Cie, of a capital of 9,000,000 francs, with its official residence at Joeuf in the French department of Meurthe et Moselle, on French territory, though until the armistice it and all contiguous fields of iron ore had remained in the hands of the invader since the early days of the occupation in 1914.

To redevelop France there will be required a great influx of capital, which is likely to be exclusively French, and a great acquisition of machinery of various kinds, which is likely to be largely American if that which Americans can offer is wholly adapted to the uses to which it is to be put.

The New Normandy Concessions

The iron mining basin of Normandy which first really came into the limelight in the years just previous to the war, and rather more vividly since its history of German intrigue has been written in these last months, is divided into 21 concessions, covering an area of approximately 53,000 acres, in three departments, the Orne, Calvados and the Manche.

The Saint Andre exploitation is now in great activity and benefits greatly from its proximity to a main line railroad running from Caen to Fleurs. Its capital is $560,000 of which a notable part was held previous to the war by "straw men" for the benefit of the real German owners. Production in 1911 was 32,000 tons; in 1912, 45,600 tons, and in 1913, 72,000 tons. Future extractions will possibly equal 100,000 tons per annum.

The Bully et de Mallot concession is a development of the financial sponsors of the Saint Andre group, and covers approximately 900 acres. The discoveries made by its early exploiters were not encouraging and the deposit is reckoned of a notable poverty to date, whatever may be forthcoming in the future.

The May-sur-Orne concession was first accorded in 1895 on 2500 acres and is today exploited by the Société des Mines et Produits Chimiques. Its production has been as follows: 1909, 60,000 tons; 1911, 54,000 tons; 1912, 81,600 tons.

The most important concession installed on this Norman geological formation is that of Soumont, covering about 2000 acres. Its parent is the Sociéte des Mines de Soumont and is a near cousin to the Société des Hauts Fourneaux de Caen, which latter society also exercises parental rights over the neighboring concession of Perriéres, of approximately 3000 acres. Before the war all the effort of the Caen society was brought to bear upon Soumont. The mineral at Soumont was found at a

depth which offered some difficulties of operation, as also did the fact that a rail line was necessary to transport the ore to the furnaces at Caen, or to the docks at Caen or Ouistreham, where a large part of it was diverted to German interests.

German Interests in Companies

The concession of Barbery, of about 700 acres, was exploited by the Société des mines de Barbery et d'Urville. Work was begun in 1903 but owing to flooding in 1908 work was stopped temporarily. In 1911 under the German Gutehoffnungs Hutte they were opened again. Owing to physical conditions it is not known what this exploitation may offer for the future.

These are some of the minor developments of the Normandy basin. No estimate of their worth or their possibilities should be made without full recognition of the weight of the hand in the velvet glove of German origin which was laid on these Norman deposits a few years before the war. Not only is it necessary to consult the geological surveys for information but to carry the investigation farther into the realm of finance. Then one learns of the depth of the German participation, and Germany was not likely to pour its cash into a bottomless pit. It is this that makes one think there is more in this subsoil of the Norman cattle fields than appears on the surface.

The official list of the government sequestration of German belongings in France gives another interesting chapter. There were German interests in the Mines de Fer de Saint Andre, Bully et Maltot, the Mines de Fer de Barbery et d'Urville, the Mines et Carriéres de Flamanville (Thyssen) and equally in the Societe des Minerais de Fer de Basse Normandie. Many of these are directly traceable to Thyssen, but others are readily placed on the shoulders of the German companies of Phoenix, Hoesche and Deutsch-Luxemburg.

The problem for the French intensive exploitation of these deposits is difficult for, as an essential element, fuel is almost as necessary as the mineral itself, unless the electric furnace is practical of application, in which case there is waterpower near at hand.

The mines of northern France, when they get running to capacity again, can furnish an adequate supply of coke if transport can be furnished for a haul of 300 miles, but there are northern furnaces which have to be fed. Coke production is, and will be for a long time, insufficient. The alternative for economical and immediate working of the Lorraine iron ores is coal from Westphalia. Here comes the question of exchange. To import coal or coke from Germany there must be a medium of exchange —cash or mineral, which? And what will be the economic effect of this on France, still bleeding from her wounds?

A principle laid down by all French economists and by the industrial world of metallurgy is that French ore must be reserved for the alimentation of French furnaces and French metal industries. It must not be forgotten, however, and doubtless it will not be in the final settlement, that the German coal deposits of the Basin of the Saar, scarce 25 miles away, belong to the German government. The obvious solution then is that the German government should pay part of its debt in coal.

There is still another resource of this region of Lorraine. A few years ago it was demonstrated beyond doubt that the coal fields of the Saar actually lapped over into the French department of Meurthe et Moselle. Seven demands for concessions for exploitations had been made before the war, covering a superficial area of 78,000 acres, but nothing ever came of them so far as actual exploitation was concerned. The coal lands of Meurthe et Moselle may now be requisitioned and worked for government account.

Allies to Control German Coal

Two years, at least, according to the statement of Monsieur Tardieu, will be necessary before the French coal mines of the north can be put into operation. Meantime the allied troops are occupying Westphalia and the valley of the Saar where are the richest coal mines of Germany, the Belgians are back in their own country which supplied tens of thousands of tons of coal to Germany and France before the war, and the mines of Luxemburg

ROLLING SHELL BILLETS AT SAINT CHAMOND

are in the hands of the allies. For the present it is to be supposed the French will draw coal supplies from one or the other of these fields, and as much as they can from their own.

The actual operating regime in the Westphalian coal fields in the future is still vague. A sidelight worthy of being taken into consideration is quoted from a recent issue of the *Hamburger Fremdenblatt* wherein it is stated that the Westphalian mines have in reserve their own fleet of colliers of 300 tons net, carrying perhaps 1000 tons. These are, or were, for the armistice specifically forbids German ships to take the sea, intended to revive the relations of Germany with neutral and allied powers. In all probability what coal comes from Westphalian mines for a long time, whether transported by sea or by the relatively shorter haul across Luxemburg to France, will be wholly under the control of the allies. The elaborate canal system of northern and eastern France will also help, if the canals are not obstructed.

The substitution and development of water power in France is destined to undergo a notable development at an early day. In the Alps and the Pyrenees new development is already noted as the result of the efforts of the past four years, but as yet there is nothing like the volume of power derived by Italy, which, entirely bereft of coal, naturally looked to hydraulic and hydro-electric power.

French engineers estimate that 60,000,000 horsepower can be made readily available, and this may counteract the need for the large quantities of coal which were formerly imported for industrial and domestic purposes, more than 20,000,000 tons a year.

One of the biggest waterpower enterprises in the process of development is known as the Dauphine-Centre, its *force-motrice* having its origin in the mountains of Dauphiny, in the River Isère and its tributaries. It will distribute itself, as transformed electricity, through 125 miles, and will centralize all the various sources which can be brought into the Dauphiny capital of Grenoble and throughout a contiguous region, which in turn will be tapped on the other side by the sources of the Plateau-Central through a *couplage* which will be made at Saint Chamond, one of the big steel producing centers of France.

The regime of the water-flow in the mountain rivers of France is very irregular, ranging all the way from three and a half feet to 60 feet, in both the Alpine and the Pyrenean regions. Rainfall, aside from subterranean sources of water supply, accounts for the variation, it being estimated that there is practically rainfall of a foot in some regions, but a bare inch or two in others, over an area of nominally 500,000 square kilometers affected by these hydro-electric projects.

France's Transportation Problem

The march of events attendant upon the signing of the armistice has changed the whole conjecture as to what France might have experienced had it merely driven the Germans back bit by bit without the smashing victory that was achieved. French rolling stock was at the lowest ebb a first-class country ever experienced. It was impossible to believe that enough railway material would be captured from the Germans in northern France and Belgium to have more than the slightest effect on the transportation problem.

Germany was supposed to be short of locomotives and freight cars, and she probably was in spite of the many she took from Belgium and France in the early days of the war. The newly-founded Czecho-Slav state on Germany's eastern frontier recently took possession of all the rolling stock belonging to Germany which was within its borders. Germany's equipment, aside from what she took from France and Belgium, is probably but 40 per cent of what it was at the beginning of the war. The armistice provided for the turning over to the allies of 500 locomotives and 150,000 freight cars, but these will doubtless have to be partly used by the allied armies in occupation of the Rhine country, leaving few for France and Belgium. It is to be foreseen, however, that there will be a pooling of transportation interests of all western Europe from the Rhine to the Bay of Biscay, and the situation will be better.

New Layout of Roads Proposed

French railroads are soon to be reorganized. Three of the seven trunk lines are practically government owned. On Nov. 1, 1918, there was proposed in the French parliament a project for "directing, operating and maintaining the administrative functions and the financial transactions" of the entire railway system of France, the plan being for the government to take control of all the lines as an aid toward general reconstruction. The proposer of the plan cited the success of the American government in operating the railroads.

French railroads were not laid out with a view to aggression from the eastern frontier, although for some archaic reason the French standard gage stopped abruptly at the Spanish frontier where the lines were continued down through the Spanish peninsula on a broad-gage, thus preventing the use of through cars for freight or passengers. In late years Germany built many short spurs running through Alsace, Lorraine and Westphalia right up to the frontiers of France. France, on the other hand, depended upon her highways. Practically all French railways centered at Paris, and there were no through connections at that. There were few direct east and west lines. This is one of the phases of reconstruction which is to receive attention.

While there is a shortage of rolling stock there is no question but that with an influx of new cars there will be more than can be handled efficiently because of the lack of locomotives, modern appliances and labor.

Statistics as to what these once fertile lands can offer in the way of *ravitaillement* are still problematic and will be for years. There are "duds", or unexploded shells, covering almost every square foot and these will have to be sought out and destroyed. What may be needed for the industrial reoccupation may be more specifically estimated. M. Tardieu estimates that 25,000,000,000 francs ($6,250,000,000 will be needed to replace industrial equipment. Iron and steel works, mines, sugar beet factories and textile mills of all kinds were located in the northern district intensively.

One of the things which is supposed to give France a better equipment for the conducting of its future business, particularly with respect to manufacturing relations, is what is known as a register of commerce. This in an index or a directory, which the government itself will issue, and is to contain the composition and output of all the firms in France rising above a certain minimum production. Its object is to keep trade at home but if it is found that it in any way affects any part of the American metallurgical industry there is always the means at hand for making an allied Franco-American company, and manufacturing, or assembling, in France. In many quarters this will be absolutely necessary if France is to keep pace with the progress of other manufacturing countries. It is either this or the possibility of working American patents on a royalty, or by outright sale. In either one case or the other America is bound to take this possibility into consideration in future working trade arrangements with France. The project of this register is still being discussed in both the upper and lower houses of the French parliament, but it appears to be approaching achievement.

"Wake Up" is New Slogan of British

Folly of Easy-Going Methods Brought Home at Bitter Cost in War Stirs Great National Movement for Rebuilding Industry Along More Extended and Powerful Lines—Reconstruction Program is Far Reaching

BY JOSEPH HORTON

British Correspondent of The Iron Trade Review

RECONSTRUCTION is a term which means, shortly, organizing for peace. England went into the war first and organized for it afterwards. On the whole, that impetuous plunge without staying too long counting the cost, has been commended by the world. But there is no reason for being equally unprepared for peace, and gradually the nation has realized this. Reconstruction is the negation of *laissez faire*, which may be said to have been rather unceremoniously kicked out of doors. John Bull is now rather ashamed of having paid so much deference to that discredited Kismet of industry, although doubtless it still retains a few worshippers, just as there are to be found believers in astrology.

Laissez faire received its death blow on that memorable day in the summer of 1914 when the declaration of war brought a sudden foreboding of financial and industrial panic. Then calamity was averted because a few leading statesmen and business men rushed to the wheel and steered the vessel of state from the rocks on which it appeared to be drifting. Now it is generally realized that while British industry has been very largely a matter of spontaneous evolution, having in fact "just grow'd" like Topsy of "Uncle Tom" fame, it can no longer safely be left to itself. Reconstruction is a convenient description of the vast number of changes involved in the reversion from war to peace. The term has been gradually evolved and has gained almost daily in its comprehensive significance. It began with demobilization pure and simple. As the country realized the vast nature of the conflict, the stupendous efforts necessary and as, month by month, the war gradually absorbed either into field or factory, practically the whole of the able-bodied male population, became alarmed at the possible consequences if peace found us unprepared.

Hence the attention given to demobilization. That means, of course, first of all getting soldiers back into industry, turning warmaking machines to the production of peace manufactures, the diversion of raw material into commercial channels, and so on. In this department the ministry of reconstruction may be said to have justified itself. Within three days after the armistice was signed, employers received a circular inviting them to make application for former employes whom they were able to reinstate. It has since transpired that the original program cannot be carried out with the promptness first intended. The position in Germany is such that our authorities deem it necessary to keep their powder dry, and only men required for special reasons will be liberated from the forces. Possibly this liberation

British Plan to Build Up Steel Industry

LARGER works.
An 8-hour day.
Pooling arrangement for sale of iron and steel.
Distribution of orders to secure long runs on standard products.
Stoppage of raw materials intended for "enemy" countries.
All transactions with such countries to be under license.
Restriction of mining concessions to aliens.
Foreign marks on imported iron and steel.
Improved transportation facilities.
Anti-dumping legislation.
A protective tariff.
Fewer labor organizations.
Improved technical education.

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THE DEMANDS OF WAR GREATLY HAVE EXPANDED AND IMPROVED THE MECHANICAL EQUIPMENT OF BRITISH SHOPS. THIS WELL-ARRANGED PLANT IS AN ILLUSTRATION OF THIS DEVELOPMENT

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BRITAIN HAS USED HER WOMAN POWER TO GREAT EFFECT DURING THE WAR. SHE PROMISES TO RETAIN THIS ADVANTAGE IN PEACE

will not comprise more than miners of whom the coal controller, has applied for 100,000, very urgently wanted to meet the country's need for coal. These gradually are being brought back. The arrangements for demobilizing may be summarized briefly. They are in the special charge of a re-demobilization and re-settlement, responsible to the ministry of labor under a controller general, Sir Stephenson Kent, K. C. B. The department is authorized to deal with all questions affecting the re-employment and re-settlement of the navy, army and air force and of civil war workers. Other government departments are cooperating. The demobilization board is under the chairmanship of Sir James Stevenson, whose primary function is to assist the transition from munitions to normal production at the various factories controlled by the ministry of munitions. These factories total about 5000 of which at least 1000 have been installed for the special requirements of the war. Eventually, there will be a universal contributory scheme of unemployment scheme of unemployment insurance for a term of years, covering the whole period of settlement, but this is in suspense for the present. For civil workers the scheme of out-of-work donation has been adopted for six months under which a donation may be paid to an out-of-work civil worker for 13 weeks and to a soldier for 26 weeks. In the latter case it will begin to run from the day of demobilization. The allowance will be either for ex-service men or civil workers, for adults, 24s ($5.76) per week for men, 20s ($4.80) per week for women, 6s ($1.44) for the first dependent child under 15, and 3s ($0.72) for each succeeding dependent child. For juveniles between the ages of 15 and 18 the amounts payable will be 12s ($2.88) per week for boys and 10s ($2.40) for girls. Attached to the juvenile department there are certain provisions requiring the recipients to attend a course of instruction approved by the president of the board of education or other central department concerned. With regard to liberation from the forces, the government has decided that demobilization, subject to military needs, must be governed by industrial requirements and broad social considerations. The order of release will bring back first of all those described as pivotal men essential to the operation of other workers. The next principle adopted is that soldiers who have places waiting for them will return earlier

Britain Sees Power Wane as Iron Production Falls Off

MEASURED by modern standards of industrial power, the position of Britain is alarming indeed." This note of warning is sounded in the recent report of the British iron and steel trades committee appointed to make a survey of Britain's needs for re-establishing her prestige as an iron and steel-producing nation.

Stress is laid in the statistics submitted on the way in which as a competitor in the markets of the world the United Kingdom has steadily lost ground. In 1880 Great Britain produced 7,700,000 tons of pig iron, the United States 3,800,000 tons and Germany 2,700,000 tons. In 1900 Great Britain produced 8,900,000 tons, the United States 13,800,000 tons and Germany 6,500,000 tons. In 1913, the record year of British iron manufacture, Great Britain produced 10,300,000 tons of pig iron, the United States 31,000,000 tons and Germany 19,000,000 tons. In 1880, therefore, Great Britain produced 54 per cent of the total output of the three countries. In 1900 her production was only 28 per cent, and in 1913 it had fallen to 17 per cent. Today it is probably 15 per cent. The conclusion drawn from this by the committee is that within recent years the powers of Britain to wage war or to hold the balance of peace steadily has diminished. The committee is much concerned over the increasing dependence upon imported material and remarks:

"Experience has shown that no finishing trade can depend indefinitely upon imported semifinished iron and steel. Ultimately the maker of the semifinished material will absorb the trade in the more highly finished article. Measured by modern standards of industrial power the position of Britain is alarming indeed. The safety of the nation demands that immediate action should be taken to raise the productive power per head of Great Britain to a level at least equal to that of Germany or America."

than those having no definite prospects. These constitute a very important body because tens of thousands of men have jobs waiting for them and would receive a very cordial welcome from their former employers. Preference also is to be given to married men over single men, to those who have had a long period of service and to time-expired soldiers enlisted on normal attestations before the war. The employment exchanges are to be utilized to ascertain where necessary how far former offers to keep open places still stand good.

Provided the necessary formalities have been carried through, drafts of men will be collected in the proper order of priority. They will be sent to concentration camps and thence to dispersal stations at home, the latter as nearly as may be convenient to the men's places of residence. Then they will receive a protection certificate, railway warrant home and a cash payment, together with an out-of-work donation policy. They will be entitled to 28 days' furlough during which time they will receive pay and ration allowances, and at the expiration of the furlough the men will be demobilized. These arrangements apply equally to the army, the air force, and with the necessary modifications to the royal navy.

Priority System Employed

Under the munitions of war act of 1915 priority of employment is required to be given by employers to those who have been serving with the colors and a scheme has also been prepared giving special facilities for ex-service men with regard to land settlement and occupation at home on small holdings, allotments or cottages with gardens.

There are a number of further details providing for the payment of fees for students whose training was interrupted by the war while assistance may be granted to a man exposed to serious hardship through having undertaken military service. These cover such matters as interest on loans, installments payable under agreements for the purchase of business premises, dwelling house, furniture and the like, while special consideration is to be given to owners of one-man businesses, many of whom have completely sacrificed such interests through their enlistment for the war.

There is an elaborate arrangement relating to the discharge of munition workers. They are not to be dismissed on large and general scale but gradually. Overtime has to be abolished, payment by results temporarily suspended and the week shortened where possible. There are other details also intended to let out workers as lightly as possible.

It will be readily understood that the whole position is liquid, altering from day to day, and may be affected very materially by events on the continent. But it is due to the government to say that the arrangements so far have given general satisfaction and there is little complaint. Factories are sliding with comparative ease into peace channels of production while a healthy sign is to be seen in leading industrial districts, hundreds of skilled workers being advertised for.

Demobilization affects not only the workers but such articles as raw

G. SCOBY-SMITH
Prominent British Ironmaster who commands effort to expand industry

material. In this latter department the general view also is optimistic, and the authorities report that they find themselves beter off than they expected as regards the amount of material such as raw metal, ferrous and nonferrous, required for peace operations of the great factories.

As already intimated demobilization has become a subordinate branch of reconstruction as a whole. We have to begin with a ministry of reconstruction with subordinate committees dealing with the subject from different aspects. For example there is a committee on the relations between employers and employed, more popularly known as the Whitley committee named after its chairman, the Right Hon. J. H. Whitley, M. P. Probably no publication of any war committee has received so much attention as the Whitley report. Then there are the committee on commercial and industrial policy, the civil war workers' committee, the committee on adult education, and others, all of which have made most valuable contributions in the way of collected information and practical recommendation.

Reconstruction gradually has come to mean nothing less than the rebuilding of British industrialism from a new post-war foundation. It will be seen at once how vast an expansion this is from the modest beginning of a mere return to peace conditions, and while demobilization has quite temporary aims and can largely be carried out by official and legislative authority, reconstruction on the other hand has to do with the future, is less amenable to legislative authority, and aims at utilizing to the fullest degree the voluntary cooperation of all parties engaged in industry.

Would Improve Industry

The reconstruction program daily grows in scope and volume. Its exposition has covered reams of paper and brought forth a series of pamphlets covering such matters as housing, industrial councils, mutual control of industry and other details. The whole program probably received a great impetus from the fact that it was initiated by the Whitley report, Mr. Whitley being a wholehearted and enthusiastic social and industrial reformer. Speaking a few days ago at Rotherham, Mr. Whitley said:

> One of the first aims of the after-the-war period ought to be that the whole of humanity in these islands so far as we controlled it should be lifted up at least 100 per cent in health, in housing, in education, and in the general standard of life and intelligence. To do that one thing was absolutely certain. There must be 100 per cent improvement in the conditions of industry.

This zeal for a revolutionary overhauling of business and manufacture characterizes all the reports of the various committees which have so far appeared, and they constitute one of the most interesting departments of war literature. Taken as a whole they are a serious impeachment of British methods of running business which leaves scarcely any department untouched in its sweeping criticism.

John Bull apparently has learned many things during the war. He is commonly supposed to be like most corpulent and prosperous people rather somnific in his temper, subject to long afterdinner naps, the natural sequel to adipose, repletion and prosperity. This was his temper when early in the war he boasted that

he was carrying on "Business as usual," as if the defeat of the Germans was a sort of left-hand hobby to be comfortably got through while his right hand was free to attend to his ordinary concerns. He is very much awake now and according to these reports, in the mood for vigorous self-flagellation.

There is a story told of 42 British commercial travelers all housed temporarily at a hotel in Shanghai and all out for a certain contract in the manufactured cotton piece goods. It was, of course, a gross waste of time and the sequel which will hardly surprise Americans was that the business was eventually captured by the representatives of Japanese houses able to undersell the Englishmen because they manufactured on a large scale under more economical conditions and sold their goods on a pooling or co-operative system. The reformers are out to bring British industry into line in these and other matters.

To Thoroughly Reorganize Industry

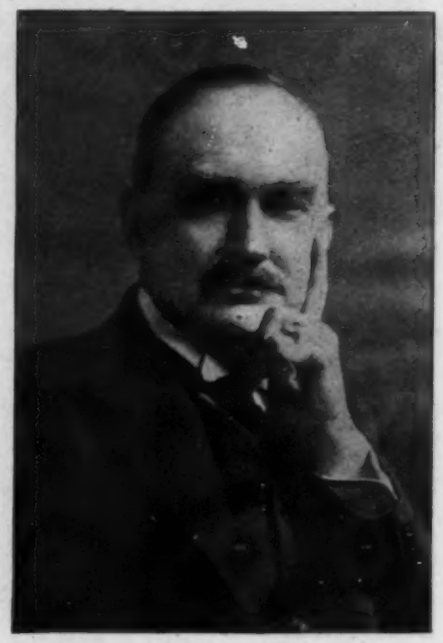
The report of the iron and steel trades committee is of so much importance that other departments of reconstruction must be very lightly passed over in this while everyone has heard of the Whitley report and its program of joint industrial councils. According to Mr. Whitley 36 of these have been established in the country. They seek to revolutionize labor matters by establishing a joint council of employers and employed. But it is proposed that they shall settle many other matters undertaking the thorough reorganization of industries in the general interest, increasing output, promoting needful legislation and making when necessary joint representations to the government.

The committee strongly recommends the establishment in imperfectly organized trades, of trade boards of the kind formerly applied to the chain and other trades, in which wages jointly agreed upon can be enforced in the law courts. The essence of the industrial council is that it aims at complete self control of the industry and to these bodies will fall the duty, strongly insisted upon, to unify each industry with a view to economical production and sales under the pooling system.

One important committee devoted to commercial and industrial policy has a drastic proposal to prohibit the importation of goods of enemy origin for at least 12 months with full liberty to prolong the period to whatever extent may be found expedient.

The committee on commercial and industrial policy gave special attention to the treatment required for certain essential industries and this committee has materially assisted in the negotiation by which supplies of spelter and tungsten on which this country was formerly dependent on Germany now are obtainable within the empire.

The committee on currency and foreign exchanges has elaborated a number of regulations with the object of restoring the financial balance and has in view also such modifications of the banking system as will secure readier financial support to inventors and new companies who have in the past frequently been dependent on foreign capital for the development of their enterprises. As already suggested the report of the departmental committee appointed by the board of trade to consider the position of the iron and steel trades after the war is second to none in importance among the departments of reconstruction. This committee, however, was appointed under the board of trade as far back as March, 1916, long before the ministry of reconstruction was devised. Early in the war the intimate relation between the iron and steel trades and the provision of munitions was realized and it became evident that the practical arrest of iron and steel progress in this country was so favorable to the war policy of Germany that it might well have been part of the German program. The committee consists of the following: G. Scoby-Smith, chairman, Sir Hugh Bell Bart, Archibald Colville, John E. Davison, James Gavin, John Hodge, M. P., John King, George Muir Ritchie, Henry Summers and Benjamin Talbot. In its report the committee says:



BENJAMIN TALBOT
Member of National Iron and Steel Committee

The committee has endeavored to approach the question of the future position of the iron and steel industries with minds free of preconceived political views or economic theories. Its purpose has been not to test abstract doctrines but to establish an ordered plan of action. It does not claim for its conclusions universal force or validity or desire to found upon them any gospel of politics or economics. With their application to industries which lie beyond the purview of the inquiry it is not concerned. Basing its findings upon the broadest induction it has endeavored to give shape to a coherent scheme of industrial reconstruction.

The leading principle which emerged at an early stage of the inquiry has been a profound conviction that the safety of the nation depends upon the command of the resources of iron and steel, without such command the army, the navy and the mercantile marine must be alike reduced to insignificance. Political existence must be founded upon commercial and industrial strength. Although economic interests of individuals may in certain cases conflict with the necessities of the empire the committee is convinced of the real unity of imperial and industrial policy and the problem for which it has, however imperfectly, attempted to reach a solution is to give to the nation industrial resources which in time of peace shall preserve the prosperity of Great Britain and in time of war shall give her full command of resources adequate to the defense and safe keeping of the empire.

Germany's Large-Scale Production

After commenting on Germany's rise in the production of pig iron and Great Britain's retardation, the report pointed out that while Germany has had to depend largely on imported raw material, her great competing industries have been organized for large-scale production and small installations held and worked by individual owners are comparatively unknown. The report says: "The individualism of the British character often has led the iron and steel manufacturer to prefer to retain personal control over a small and relatively inefficient works rather than pool his brains and capital to the greater ultimate advantage of the industry. The United States Steel Corp. alone controls an output of iron and steel greater than the whole production of the United Kingdom."

The report then goes on to complain of lack of organization for sales, the serious handicap due to poor and expensive transport, the superior efficiency of German and

American plants and the comparative helplessness of the British trade in the presence of the foreign dumping policy. On this subject it is remarked: "There is a general opinion that until recent years the policy of foreign syndicates probably had no motive beyond the desire to obtain commercial control of the British market. But from 1911 onward the commercial policy of Germany seems to have been inspired by the intention so to cripple the iron and steel industries of this country that Britain would be hopelessly outclassed in a war of material."

It is further complained that capital is less profitable and less secure than in Germany and America, that modern plants are to small and that they are carried on too long without reconstruction. "It is a matter of sad experience that no investment in an iron and steel undertaking in Great Britain could be regarded as reasonably safe. Unless confidence is created in the financial world as to the stability and future prosperity of the iron and steel industries it would be futile to expect the investing public to subscribe so large an amount as is necessary for the equipment of an iron and steel plant." There is a great deal more said to the same effect, all conveying the impression that under existing circumstances the British iron and steel manufacturers regard themselves as hopelessly beaten in world competition in iron and steel commodities.

Among other proposals is one that an organization be formed for obtaining adequate supplies of iron ore. Another that there should be a national selling organization for marketing British iron and steel; that manufacturers should combine to lay down large and well-designed units for cheap production on modern lines.

Apparently the most revolutionary change proposed comes under the head of protection, and it is pointed out that dumping has become a positive danger. "The committee has heard the evidence received from producers, manufacturers and importers of iron and steel that dumping has reached such a pitch that the production of iron and steel in Great Britain is seriously restricted and imperilled." The committee then goes so far as definitely to propose import duties, saying:

The committee is convinced that for the future safeguarding of the iron and steel industries it will be necessary to establish a system of protective duties, and in this opinion it is supported by the practically united feeling of the British iron and steel producers. . . . The maintenance of a great open market in the midst of of the greater producing nations of the world is incompatible with the prosperity and even with the existence of a native iron and steel industry. . . . The conditions of competition between Great Britain and her rivals are thoroughly unequal. The iron and steel industries of Germany and America are protected from retaliatory action by heavy tariffs. . . . By reason of a free trade system Great Britain has been compelled to divert her greatest strength from export to the struggle for maintenance of her markets at home.

WHERE INDUSTRIES ALL OVER THE WORLD HAVE BEEN FINANCED. THE ROYAL STOCK EXCHANGE AND THREADNEEDLE STREET, LONDON, ENG.

Recommends Protective Duties

After recalling the severe blow inflicted on the Welsh tinplate industry by the McKinley tariff, the committee definitely recommends that customs duties be imposed upon all imported iron and steel and manufacturers thereof, the amount of tariff to be determined by the needs of the industry protected and those of the nation. The committee strongly argues that from the labor standpoint it is not to the workman's interest to permit the unchecked import of the product of foreign labor working under conditions far less favorable than those of British labor.

It should be added that with regard to all these recommendations for protection, Sir Hugh Bell is a steadfast dissenter and sets forth an argument from the standpoint of thoroughgoing free trade.

Under the head of labor there is a strong plea for better organization within the industry and it is pointed out that very serious trouble arises because in a single iron and steel works a man may belong to any one of half a dozen different unions. On this the committee says:

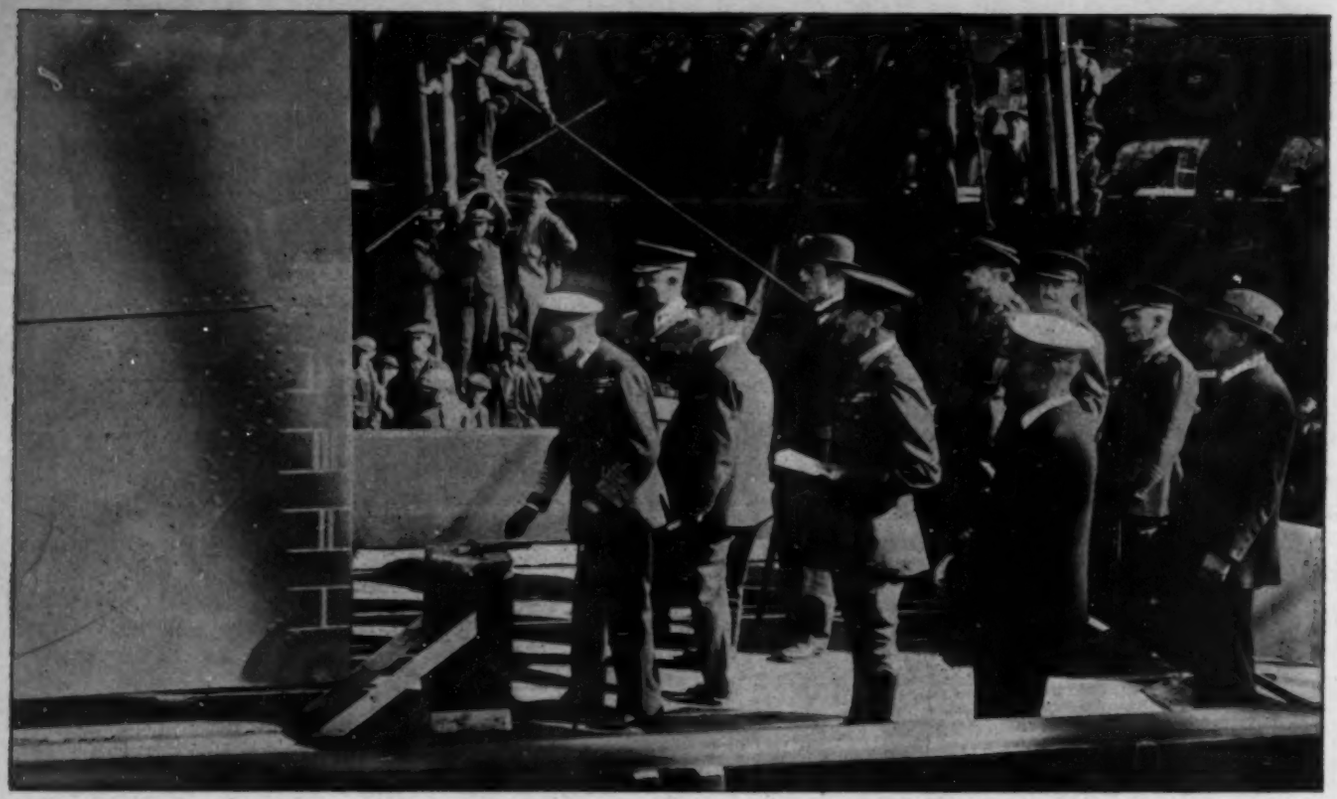
All labor employed in the iron and steel industries should as far as possible be brought together under the authority of a single trade union and these relations should be further extended by including unskilled labor wherever possible in agreements which are made from time to time. Employers should encourage this movement. The enlarging of the sphere of activity of trade organization would tend to wider views and better understanding between employers and labor.

There is some recognition of the excellent work done by the Northern and Midland wage boards, but unfortunately there are several branches of the iron trade not subject to such boards. With regard to produc-

Britain's Production of Iron and Steel

Year	Iron, tons	Steel, tons
1913	10,260,315	7,663,876
1914	8,923,773	7,835,113
1915	8,793,659	8,550,015
1916	9,047,983	9,196,457
1917	9,420,254	9,804,079
1918	*9,792,525	*10,411,657

* Estimated.

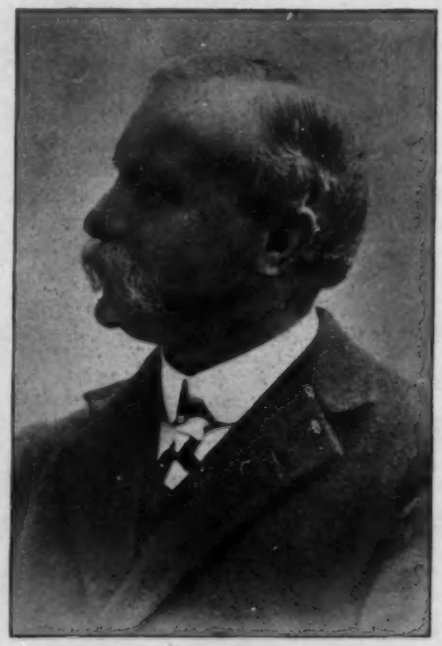


SHIPBUILDING ALWAYS WILL BE THE KEYSTONE OF BRITISH INDUSTRIAL AND COMMERCIAL STRENGTH. KING GEORGE AT THE RECENT LAUNCHING OF ONE OF THE LATEST ACQUISITIONS TO ENGLAND'S MERCHANT FLEET

tion it is stated: "If the British iron and steel industries as a whole are to regain their place in the trade of the world, restriction of output must be definitely abandoned." It is recognized that mills and furnaces work fewer hours in Great Britain than in America and Germany largely because of the foreign system of working late on Saturday or even throughout the weekend. This balance, it is suggested, can only be compensated by plant and appliances being brought up to date and by more intensive labor than in the past during the fewer hours.

There were strong complaints of disadvantages arising from deficient and expensive transport and higher cost of carriage generally and a plea for better railways and canals, while the trade is handicapped through unfavorable shipping rates. The final summary of recommendations comprises no fewer than 61, the general effect of which would be scarcely less than a revolution in the industry. They comprise the stoppage of exports of raw material to enemy countries; all transactions with enemy countries to be under license; refusal of mining concessions to aliens without government sanction; complete organization of iron and steel manufactures for selling purposes; larger works; distribution of orders to secure long runs on standard products; piecework wherever possible; the 8-hour day; anti-dumping legislation; foreign marks on imported iron and steel; improved technical education, and many other matters of subsidiary importance.

It cannot be said that there is great confidence among those best informed on the probability of co-operation. Something has already been done in the formation quite recently of a National Federation of Iron and Steel Manufacturers, with an office in London. This enlarges and supersedes the old Iron and Steel and Allied Trades federation, and there is a general amalgamation of opinion and sentiment, but individualism is in the blood of the British manufacturer and there are very strong doubts whether that sentiment will be so far overcome as to secure large scale production and the pooling of sales on the German principle.



JOHN KING
Member of National Iron and Steel Committee

The strong lead given by government departments and the great willingness of politicians and statesmen to co-operate with heads of industry is a new element equally in British politics and in industrialism. The country has learned many things during the war and is much more disposed to listen to the appeal uttered by King George some years ago in his memorable industrial war cry, "Wake up, England." There is undoubtedly a great wave of reforming zeal in motion and it is just a question whether it will continue long enough and maintain sufficient momentum to realize the great ideals of initiators like Lloyd George, Mr. Whitley and others. If reconstruction on these broad lines materializes, British trade and commerce promises to be a much bigger thing in the future while many serious social stains of which every true Englishman is ashamed, will be removed,

Prospects for World Trade in Steel

North America and Europe Divide World's Capacity and Are Competitors for Big Trade of Non-Producers—European Plants Unable to Seek Former Markets for Several Years

BY SAMUEL A. BENNER

THE making of steel in the United States of America, prior to the outbreak of the war now being concluded, reached its highest point during 1912 and 1913, when yearly production exceeded 31,000,000 gross tons of ingots and castings. Both domestic consumption and export demands were quite large during that 2-year period. Then came 1914, when both home and foreign requirements fell to subnormal levels, the output barely exceeding 23,500,000 gross tons of ingots and castings, or about 25 per cent below the two previous years. Indeed, 1914, from the standpoint of percentage of production from the previous year, was almost as drastic as 1908 when the trade suffered so much from the financial panic of the previous autumn, only obtaining enough business to make 14,000,000 gross tons of ingots and castings, in comparison to 23,400,000 in 1907 (a very good year), or about 40 per cent under that total.

The year 1915, however, made a new high record, the production of ingots and castings exceeding 32,000,000 gross tons. This year will long remain a famous one in the annals of the iron and steel trade of America, witnessing as it did the first strong evidences of the tremendous demand coming upon us from abroad, not only from Europe for war purposes but also from the markets that, owing to the exigencies of the conflict, could not be supplied from Europe as before, and the beginning of our sudden expansion in capacity to endeavor to satisfy that demand. Prices commenced to soar during 1915, continued to reach higher and higher levels throughout 1916 and well into 1917, and have since been held within bounds only by the firm control of our government at Washington exerted after we ourselves had joined the allies against the Central Empires. What this tremendous demand caused by the war meant to us is registered in the gross ton outputs of ingots and castings for the years 1916 and 1917, they being respectively 42,800,000 and 45,000,000; and the figures for 1918 will in all likelihood closely approximate those for 1917. It is, indeed, almost unbelievable that the United States made in 1917 and again in 1918 over three times as much steel as in 1908, nearly twice as much as in 1914, and almost 50 per cent more than 1912 or 1913—the prewar high-record years.

The following table gives our "actual output" for the last 15 years in gross tons of ingots and castings:

1918.....	45,000,000	1910.....	26,095,000
1917.....	45,065,000	1909.....	23,955,000
1916.....	42,800,000	1908.....	14,025,000
1915.....	32,150,000	1907.....	23,360,000
1914.....	23,510,000	1906.....	23,400,000
1913.....	31,300,000	1905.....	20,025,000
1912.....	31,250,000	1904.....	13,860,000
1911.....	23,675,000		

"Rated Capacities" in North America

There is a difference between "actual output" and "rated capacity" in all lines of mechanical endeavor. Rated capacity means the greatest possible theoretical production provided *all* the factors involved are favorable, such as absence of labor troubles, full order books, plentiful supply of transportation facilities, financial confidence, etc. In 1917 all such conditions were extraordinarily favorable, and doubtless the output of 45,000,000 gross tons made that year was really about all that could be produced with the equipment then in existence. In the iron and steel industry, maximum actual output is usually estimated at about 5 per cent less than rated capacity. Based on this difference, the theoretical rated capacity of the United States of America is now 48,000,000 gross tons of steel ingots and steel castings per annum.

During 1912 and 1913, our country produced 31,000,000 gross tons each year, and exceeded that output by 14,000,000 gross tons each year in 1917 and 1918. However, while business was good during 1912 and 1913, yet the entire capacity of the country was not fully occupied, the rated capacity then, as well as in 1914, when no extensions of moment were completed, being estimated by a number of well informed members of the trade at 37,000,000 gross tons per annum. Beyond doubt, the theoretical rated capacity of the United States has increased by at least 11,000,000 gross tons per annum, since 1914.

In the period immediately preceding the opening of the war, Canada possessed a capacity of 1,200,000 gross tons of ingots and castings yearly, and since then has built additions to the extent of 1,000,000 gross tons per annum, all of which has been in full use for several years past. Mexico still possesses the same capacity she had five years ago, 150,000 gross tons

Based on the foregoing, the yearly total theoretical "rated capacity" of North America as of Jan. 1, 1919, stands at 50,000,000 gross tons of steel ingots and steel castings as a minimum. In any event, however rated capacity is figured, we are certain that the three North American countries making steel actually produced during 1917 the great total of 47,000,000 gross tons of ingots and castings, and approximated the same actual output during 1918.

Germany and Austria-Hungary seized during the war the iron and steel regions of Luxemburg, Belgium, northeastern France, Russian Poland and southern European Russia. These additions to their own facilities apparently gave them sufficient output to obviate the building of more capacity.

Prior to the collapse of the old Russian empire, additional facilities were built in southern Russia to the extent of 1,000,000 gross tons per annum over the prewar total. During the war, France (in the territory not occupied by the Germans) built 1,000,000, Italy 750,000 and Sweden and Spain each 200,000 gross tons per annum of new capacity. Great Britain early in the war recognized the necessity for largely increasing her steelmaking equipment, especially for ships and shells, and when Mr. Lloyd George became minister of munitions, relieving Lord Kitchener of the problems of supply, great sums of money were devoted to steel extensions in Great Britain, these being estimated now to total 4,000,000 gross tons per annum of capacity.

All these additions in Europe amount to 7,150,000 gross tons, and as that continent possessed 45,300,000 gross tons at the opening of the war, it now appears to have a theoretical "rated capacity" of 52,000,000 gross tons of ingots and castings annually.

In the other sections of the world,

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the estimated steelmaking total capacity prior to the war was 1,100,000 gross tons per annum. Japan seems to be the only country outside Europe and America that built extensions, her additions amounting to 300,000 gross tons, thus making the theoretical "rated capacity" outside Europe and America 1,400,000 gross tons of ingots and castings per annum.

From the accompanying table, it is perceived that 98½ per cent of all the equipment for making steel in existence throughout the world is concentrated in North America and Europe, and is now divided about equally between the two districts. This concentration is due primarily to the immense coal fields located there. Only 1½ per cent of "rated capacity" is found in other countries.

How World's Steelmaking Capacity Has Increased Since the War

RATED CAPACITY, IN GROSS TONS, OF INGOTS AND CASTINGS

Country	July 1, 1914	Additions	Jan. 1, 1919
United States	37,000,000	11,000,000	48,000,000
Canada	1,200,000	1,000,000	2,200,000
Mexico	150,000	.....	150,000
NORTH AMERICA	**38,350,000**	**12,000,000**	**50,350,000**
Germany including Luxemburg	19,500,000	.....	19,500,000
British Isles	8,500,000	4,000,000	12,500,000
Russia	5,000,000	1,000,000	6,000,000
France	4,800,000	1,000,000	5,800,000
Austria-Hungary	2,800,000	.....	2,800,000
Belgium	2,600,000	.....	2,600,000
Italy	1,000,000	750,000	1,750,000
Sweden	700,000	200,000	900,000
Spain	400,000	200,000	600,000
EUROPE	**45,300,000**	**7,150,000**	**52,450,000**
Japan	300,000	300,000	600,000
Australia	150,000	.....	150,000
India	150,000	.....	150,000
THE ORIENT	**600,000**	**300,000**	**900,000**
All other countries of the world not over	.....	.....	500,000
GRAND TOTAL	**84,250,000**	**19,450,000**	**104,200,000**

In the year 1916, when our production reached 42,800,000 gross tons, at least 25 per cent of that total, or over 10,000,000 gross tons, was devoted to ocean export work. A large part of this foreign trade in 1916 was with the allies for war purposes, the remainder going to the outlying markets that up to the beginning of the war looked much more to Europe than to us for their steel supplies. Just what proportion of the 45,000,000 gross tons produced in 1917 and again in 1918 was devoted by ourselves and our allies to the winning of the war we do not exactly know, but it probably exceeded 50 per cent of the entire output during those two years.

Prior to 1916, we seldom sent overseas more than 15 per cent of our output. Such foreign trade was not with Europe at all, as normally we cannot ship steel to Europe any more than Europe can ship steel to us. Our foreign business was with the nonproducing markets lying entirely outside of Europe and the United States. It is estimated that even including manufactures of steel, such as agricultural machinery, automobiles and trucks, locomotives, railway cars, bridges, etc., in addition to direct steel exports, we never employed in any one year during the prewar period over 5,000,000 gross tons of ingots and castings in such overseas foreign trade. Europe's share of this trade was much more than ours, probably three times as much, requiring the use in some years of 20,000,000 gross tons of capacity.

The hostilities having ceased, and the tremendous demand for war-steel being over, the resumption of our domestic business along peace lines constitutes our big problem of readjustment. The railroads of the country consumed before the war, about one-third of our steel output. They now seem to be in an *impasse* from which extrication is difficult and but little new business appears possible from them for some months to come. No construction projects of moment other than those relating to the war have been attempted since 1916, and thousands of such projects are therefore in abeyance. The country is more bare of stocks of finished steel, either at the mills or in distributing warehouses, than for many years past. In the minds of the public, prices appear so high in comparison to those ruling prior to 1915 that the substantial resumption of new construction and replenishment of stocks seem to be impossible without marked concessions from present levels.

This situation at home is paralleled abroad in the overseas nonproducing markets. These districts for some years before the war took from Europe and the United States 7,500,000 gross tons of finished steel in a "bad" year to 15,000,000 gross tons in a "good" year. These markets comprise such great areas of the globe as Latin America, Africa, Australia, China, Japan and India. So little steel in proportion to normal requirements has been received by them during the last four years owing to high prices and lack of ships that business to the extent of probably 25,000,000 gross tons of finished material appears to be banked up among them awaiting the arrival of conditions permitting its release. Europe itself may require steel and machinery from America for the repair and replenishment of equipment necessary to enable it to manufacture at home what may be needed for rehabilitation, but it is only reasonable to assume that the great steel industries located there, embracing one-half of the total "rated capacity" of the world, will ask no more than that of us.

A review of the entire range of prospects for the present year forces the conclusion that our output will be decidedly less than in 1918 and 1917. Indeed, 1919 may be another 1914, when only 23,500,000 gross tons of ingots and castings were made. The building of merchant ships will still continue at a high rate, but heavy reductions in war and railroad requirements are inevitable. As a help in gaging the possibilities, in the 5-year period of 1909 to 1913 inclusive, our output ranged from 23,675,000 to 31,300,000 gross tons of ingots and castings, averaging a little over 27,000,000 gross tons.

The allies and the United States for many months past have been taking ships from all the oceans and concentrating them on the "bridge to Europe" across the north Atlantic. Already the release of some of these boats for service in other routes has begun. If our readjustment of prices has settled to a firm basis by the time there is a fair supply of ocean shipping space available to the outlying nonproducing markets, we may expect large business from them. So far as the present year is concerned, the mainland of Europe will not be able to compete for this trade, as political and industrial conditions there will prevent such competition. Great Britain and Sweden alone will be our competitors for the moment. The great banked-up tonnage in these

outlying markets is a prize worth seeking under present conditions.

Prior to the opening of the war, the countries of Europe competing with the United States in the overseas export trade were the British Isles, Germany, including Luxemburg, Austria-Hungary, Belgium and Sweden. But little competition came from France and none at all from Italy and Spain. Sweden's exports comprised the finer grades of steel. Our formidable competitors for the ordinary qualities were the British Isles, Germany, including Luxemburg, Austria-Hungary and Belgium. How much time will be necessary to enable the last four to rearrange their steel industries is, of course, not certain, but it will likely amount to several years. So far as the Central Empires are concerned, the immediate future of their steel export trade is involved in the question of ocean vessels and this question when settled at the peace conference will likely handicap them. There are many reports to the effect that many of the steel works in Belgium and in northeastern France were destroyed or dismantled by the Germans, but specific information is not now available.

However, taken all in all, competition from Europe should be for several years to come much less severe than during the years immediately preceding 1914. When trade among the various nations of Europe is once again fairly free, we may expect the steel industries located there to compete as strongly for the outlying markets as before the war. Europe for a long while to come will have an advantage over the United States in these markets, due to the fact that its population is three times as great as ours, giving Europe a much greater purchasing power for foods and raw materials to pay for which in the past the European countries delivered coal and manufactures including steel.

Europe has also had a very considerable advantage over the United States due to the tremendous amounts of money it had invested in these outlying markets. Indeed, the United States is the only country outside of Europe that has succeeded in discharging its obligations to Europe, and we were only able to do it within the last few years. In fact, we have gone much farther inasmuch as we have advanced many billions of dollars to the allies in Europe. From now on it is only reasonable to expect that the United States will participate to a very marked degree in the financing of governments and industries in the districts lying outside of Europe and our own country. This financing will be of great aid to our steel trade as constructive materials are naturally supplied by the country advancing the money.

Britain Grips Tool Trade by Licenses

BY H. COLE ESTEP

LONDON, Dec. 15.—Although as far as tariff schedules are concerned Great Britain still clings to her traditional free trade policy, manufacturers of machine tools and machine shop equipment are enjoying a measure of protection that even Mark Hanna at the zenith of his career would scarcely have had the courage to advocate. This protection is obtained through the continued strict control of imports under the authority vested in the ministry of munitions by parliament as a war measure. Furthermore, it is quite probable this control will not be relinquished for some months, perhaps in a degree at least not for a year.

At present a buyer of American machine tools in Great Britain must first apply to the ministry of munitions for an import license. For the past year or so it has been becoming increasingly difficult to obtain such licenses, and since the signing of the armistice conditions are unchanged.

British agents of leading American machine tool builders are not a little disturbed over the situation at present and the import problem in general also is engaging the attention of the American chamber of commerce in London.

A high authority estimates that 25 per cent of the existing machine shop equipment in England and Scotland is fit only for the scrap heap; another 25 per cent is of such a special character as to be of practically no value under peace conditions; of the remaining 50 per cent, at least half, says this authority, must undergo extensive repairs which will but partially restore its efficiency, while only the final 20 or 25 per cent of the whole is in really first-class shape. This does not apply to forge shop, steelworks, shipyard or foundry equipment, but does cover the thousands of lathes, shapers, planers, drills, milling machines, etc., with their fittings, needed for ordinary manufacturing operations.

Protecting Key Industries

Nevertheless licenses are so difficult to obtain that important importers of American tools are alarmed. Various reasons are assigned such as the shortage of shipping, the necessity for importing food, etc. But behind all this it is tacitly admitted in all quarters, and openly in some, that Britain must protect her key industries—that is industries of fundamental importance in wartime—among which is the manufacture of machine shop equipment. Furthermore, the authorities controlling this business in the ministry of munitions are closely identified with some of England's largest machine tool builders. But in fairness to them it should be said their procedure is in harmony with the existing policy of the government. one official candidly stated recently, "Our machine tool industry never was on a proper manufacturing basis. It has been sacrificed during the war for the production of guns, etc., and therefore the government is in duty bound to see it out of the woods, and to protect it until it can compete on an approximately equal footing with the rest of the world, especially the United States."

All this may be admitted, American interests in London point out, without gainsaying the fact that there are elements in the situation as it now stands that seriously threaten, in one quarter at least, the cordial commercial relations which everyone on both sides of the Atlantic is anxious to maintain between the United States and Great Britain.

The objection, from the American point of view, is not so much with the fact as with the method. It is disquieting to have every order subject to official sanction under conditions which preclude the possibility of uniformity of action, especially when such orders are reviewed by British machine tool interests. Importers of shop equipment say the standing of American machine tools, etc., in Britain is such that they could face a stiff tariff and still smile, especially since they are inclined to admit the strong points in the English protectionist argument under immediate postwar conditions. But such a tariff would be definite and operative alike on all comers, which cannot be said of the present method of controlling imports by license.

World's Division of Iron Analyzed

New Ore Resources of France Sufficient, if Developed, to Establish Her as a Leading Steel Power—Sun Goes Down on German Hopes—War Demonstrates to All Nations Value of Iron Deposits

BY A. J. HAIN

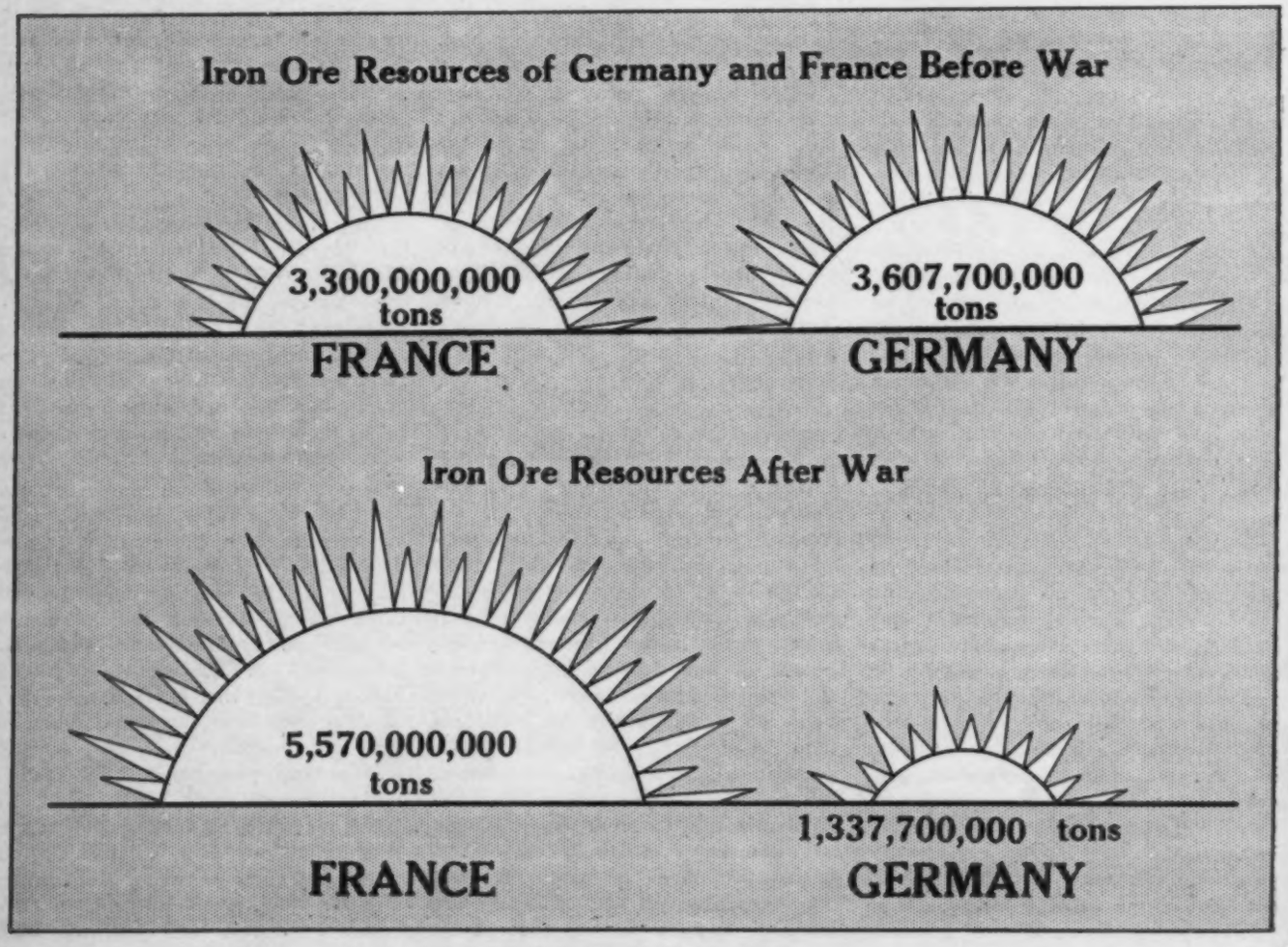
ONE of the most impressive results of the war, aside from the death blow dealt autocracy and the establishment of a more idealistic condition among men and nations, is that wondrous change yet to be fully understood and appreciated, the transformation wrought on the economic map of the world, more important than the mere geographical reformation of boundary lines. And the most significant feature of this change is that relating to the altered capacities of the leading nations for producing iron and steel.

How then are the nations now grouped as to their facilities for production? What of their respective control of the iron resources of the world? How are they realigned as to their facilities for competition in the new markets of the world? What may be expected of Germany, of France, of England, of the United States in the destinies of steel?

France has become the "Iron Queen of Europe"; Germany has been dethroned, but how long will it take France to establish her supremacy, if at all, and reap the benefits of her new possessions? And will Germany with all her facilities and experience succeed in drawing sufficiently on outside supplies to hold her own against France and reawakened England? The race is yet to be run, and in this as in all other lines of industry, the personal equation is to play an important part. Can the new fortune of France be administered successfully? An examination of what has been done and the present facilities which the nations have for "carrying on" may shed light on the future.

The treasure chest of France has been enriched by at least 2,270,000,000 tons of iron ore as a result of the triumph of the allied arms, and Germany's has been depleted by just that amount. While the actual reserves of Germany and France before the war were considered approximately the same, France's reserves are now more than four times greater than those of Germany. And Germany's possessions have dwindled to less than Sweden's.

The extent of France's new wealth of iron ore is shown by its comparison with that of the United States, the richest of all nations in this respect. On the basis of proved deposits, France's iron ore resources are now 1,312,200,000 tons in excess



GERMANY'S NEW "PLACE IN THE SUN"

While Germany and France were practically on a par so far as possession of iron deposits was concerned before the war, France's wealth is now more than four times greater than that of Germany

of those of the United States. This comparison, however, does not take into consideration the potential reserves; those of the United States being estimated at 75,000,000,000 tons, or amply sufficient to maintain this country's supremacy. But the reserves in France both actual and potential are great enough to establish her as one of the three leading nations of the world.

Germany's Production Dwindles

The home production of iron ore in Germany, excluding Luxemburg, based on prewar output has dwindled to the insignificant quantity of approximately 7,000,000 tons. The production of ore in German Lorraine in 1913 was 21,134,000 tons as compared with approximately 19,500,000 tons produced in French Lorraine. Germany having lost all the ore in German Lorraine, if the present indications as to the final peace settlement are borne out, France's annual production may be more than doubled. Germany undoubtedly has cause for keen disappointment in contemplating the fact that she had 90 per cent of France's iron ore reserves in her possession when her power was broken and she was compelled to yield 66 per cent of her own.

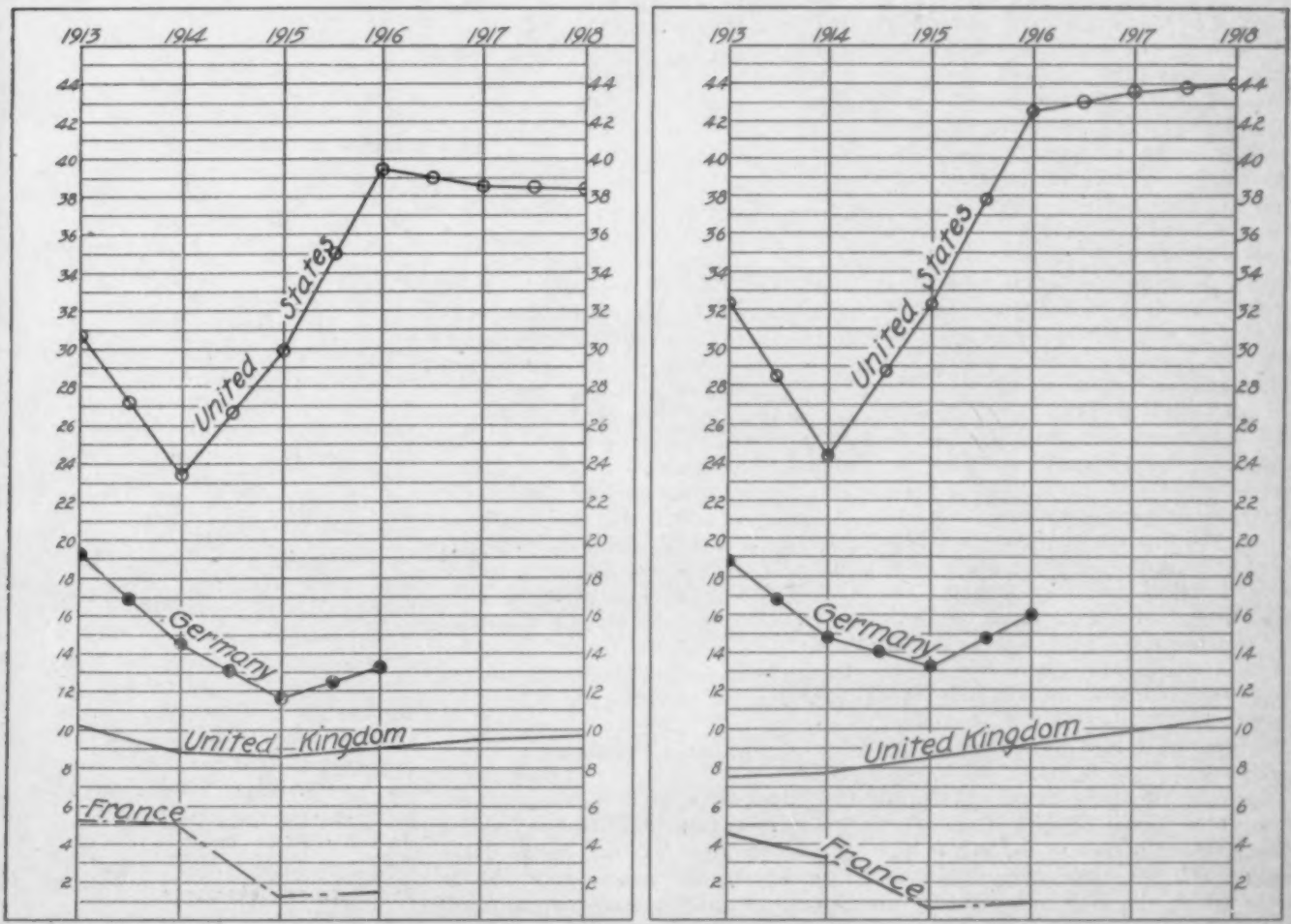
On France's side of the border line as constituted just before the war there was estimated to be 3,300,000,000 tons of iron ore, all but 300,000,000 tons of which were in Germany's grasp as her armies progressed toward Paris. On the German side of the line there were 3,607,700,000 tons, 2,270,000,000 of which were in German Lorraine. By regaining that portion of German Lorraine which was annexed by Germany as a result of the treaty of Frankfort, France will add the resources of that region to those she possessed before the war, making a total of 5,570,000,000 tons of proved reserves in her possession. Germany will be left with but 1,337,700,000 tons.

The extent to which Germany was dependent on Lorraine for her industrial foundation, iron, is illustrated by the fact that of her production of 28,600,000 tons of iron ore in 1913 more than 21,000,000 came from that district. And how sorely France would have been crippled had she lost her portion of the Longwy-Briey field may be understood from the fact that of her total production of 21,700,000 tons before the war, 19,500,000 tons came from that field.

France in Superior Position

While possession of iron ore deposits necessarily does not mean the ore will be converted promptly into commercial iron, assuming that France will obtain possession of all of Lorraine and the Saar valley, on the basis of her prewar capacity she could now produce 11,000,000 tons of pig iron annually, approximately 7,000,000 more tons than Germany could produce, with her home production of ore limited to about 7,000,000 tons. In 1913 France's production of pig iron was but 5,311,000 tons of which 957,000 tons was consumed in her foundries or exported. It is estimated that after her own requirements for reconstruction have been supplied she will have 10,000,000 tons of pig iron or the equivalent in steel to dispose of in competition with other countries. The inference is that France must develop her future trade at the expense of Germany, that each country will be the other's greatest competitor, provided Germany can

PIG IRON AND STEEL PRODUCTION IN WAR TIME



PIG IRON PRODUCTION (LEFT) AND STEEL PRODUCTION (RIGHT), SHOWN IN MILLIONS OF TONS, GROSS, FOR UNITED STATES AND UNITED KINGDOM, METRIC FOR GERMANY AND FRANCE

obtain sufficient supplies of raw material from other sources.

With the bulk of the iron ore of Europe in French possession where may Germany find the means to compete with France? France was not the only country from which Germany obtained ore. Germany imported 4,558,000 tons of ore from Sweden and 3,632,000 tons from Spain in 1913, while her imports from France in the same year were but 3,811,000 tons. Continuing her importations from Sweden and Spain as before the war she might add 8,190,000 tons or more to her own production of 7,000,000 tons and thus diminish the gap between her supply and that of France.

While Germany obtained 4,239,000 more tons of iron ore from Sweden and Spain than she obtained from France in 1913 she also imported 2,018,000 tons from other countries, the total amount of her imports having been 13,319,000 tons, of which less than a third came from France. Now to have as much iron ore as she herself produced in 1913, Germany must increase her imports from 13,319,000 tons to 20,319,000 and to have as much ore as she obtained in 1913 from all sources she must increase her imports to 33,760,000, or 20,441,000 more than she was required to import before the war.

German steelmakers frequently pointed out the increasing difficulties they encountered in obtaining an adequate supply of foreign ores, which complaint was one of the chief causes leading up to the savage aggression against France. The natural assumption is that Germany will turn to Sweden, with 1,158,000,000 tons of proved reserves, to Russia with 864,000,000 tons and to Spain with 711,000,000, but it is by no means certain that she will obtain from all the available sources sufficient ore to maintain the industrial position she occupied before the war. Sweden and Spain, awake to their new opportunities, are preparing to make greater use of their own ores; reports from both countries indicate increased interest and activity in this direction. The great national value of a well developed iron and steel industry has been brought home to these countries by the lessons of the war. And as another cloud over Germany's hopes, these two countries in 1916 only produced 12,843,159 tons of iron ore, 20,916,841 tons less than required by Germany!

Germany in 1913 obtained 489,000 tons from Russia, a field which may offer greater prospects for her in the future; 127,000 tons from Belgium, from which she may never expect to obtain further supplies; 106,000 tons from Austria; 617,000 tons from Algeria and Tunis, which are French possessions; 147,000 tons from Greece and 532,000 tons from other countries.

War's Effect on Iron Ore Resources, Production

RESOURCES BEFORE THE WAR

Germany	3,607,700,000 tons
France	3,300,000,000 tons

RESOURCES AFTER THE WAR

Germany	1,337,700,000 tons
France	5,570,000,000 tons

PRODUCTION BEFORE THE WAR (1913)

*Germany	27,441,000 tons
France	21,918,000 tons

PRODUCTION AFTER THE WAR

*Germany	7,000,000 tons
†France	42,359,000 tons

*Not including Luxemburg.
†Estimated capacity based on Germany's pre-war production.

The only hope for Germany in the light of these statistics, it would seem, is the possibility of her obtaining from the peace congress certain concessions which would at least permit her to obtain raw materials, sufficient at least to keep her industrial machine in operation so that she might be given a chance to pay the huge indemnity to be exacted as a penalty for her ruthlessness. Such an agreement might tide Germany over a critical situation and, perhaps, avert the utter collapse of her industrial strength.

Incidentally, it is interesting to note in this connection what became of France's production of iron ore before the war, in view of the fact that the Germans insist the French never gave evidence of the necessary ability for organization on a great scale and will not be able to exploit their resources to the full measure of their possibilities. It was commonly supposed that Germany obtained from France the bulk of the iron ore France did not consume, but as a matter of fact France exported to Belgium 4,697,000 tons in 1913 of her total production of 21,918,000 tons. This was 886,000 tons more than she exported to Germany. She exported 1,261,000 tons to Luxemburg, the balance of her exports going to other countries. While she exported only 69,000 tons to the United Kingdom future exports both to that country and to Belgium might be expected to show a great increase.

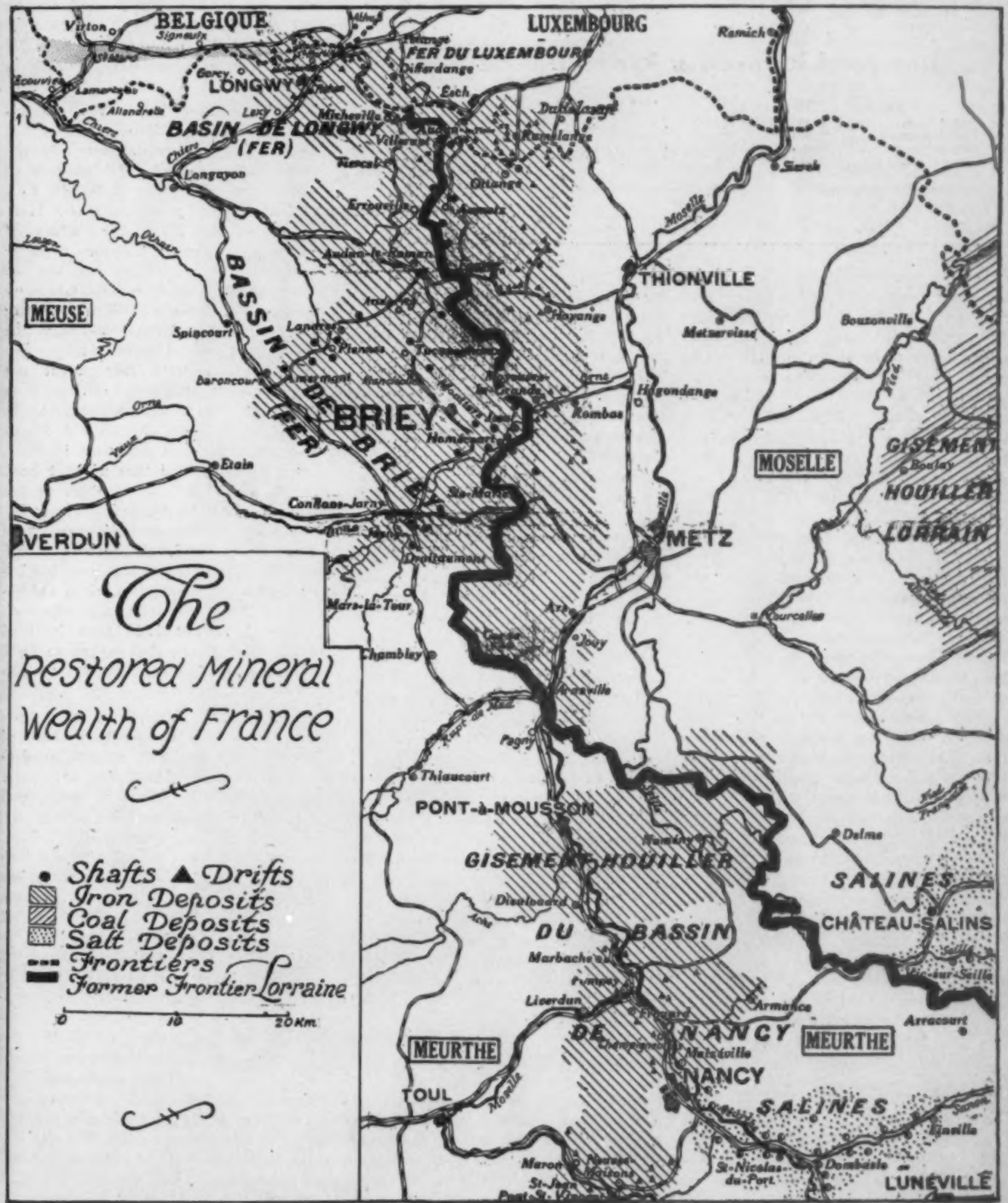
Germans Pessimistic

A most significant feature of the situation is that the Germans take a pessimistic view of the future. Dr. Felix Pinner, the financial editor of the *Berliner Tageblatt,* states in a recent issue of that paper that Alsace-Lorraine was not only one of the most highly developed manufacturing parts of Germany but "what is far more important" one of the chief sources of raw materials with which Germany "is not any too well supplied." He says that manufacturing industries based largely on foreign raw materials may be easily transplanted; the productive forces, the capital the enterprising spirit, the technical training and commercial connections involved are mobile and may be restored after a certain amount of disturbance incidental to the period of transition, but "the loss of raw material is final and irreplaceable." He refers to the incidental loss of petroleum and potash, but points out that the "most severe blow will be the loss of iron ore deposits." He summarizes Germany's present judgment on the situation as follows:

It is safe to state that without the acquisition of the Lorraine iron ore deposits in 1871 the astonishing development of the German iron and steel industry would be unthinkable. From a few million tons the German iron and steel production increased within the two decades preceding the outbreak of the war to 19,000,000 tons, far outdistancing the British production and being 10,000,000 tons behind the American production. The importance of the Lorraine deposits is not indicated by the iron and steel production of Alsace-Lorraine (2,286,354 tons in 1913), but by the fact that the entire iron and steel industry of the western part of Germany, particularly in the Rhenish Westphalia and Saar districts, depended to a large extent on Lorraine minette. The Lorraine and Luxemburg mines (the Luxemburg mining industry being closely connected with that of Lorraine and the separation of Lorraine will probably mean the loss of Luxemburg as a member of the German Customs Union) supplied in 1913, 28,500,000 tons of iron ore out of a total of 35,000,000 tons for the whole of Germany, or 77 per cent on the basis of metallic content. The loss of Lorraine would, therefore, mean that for a large part of its iron ore needs Germany would depend on foreign countries, while in 1913 it imported foreign ore to the extent of about 14,000,000 tons, with a metallic content of 7,700,000 tons. It is true that Germany will still be able to import ore from Sweden, Spain, Russia, and perhaps, even from France, but the raw material basis of its industry will be narrowed to such an extent as to endanger its maintenance and further development.

Dr. Pinner closes his article with be-

littling reference to France's capabilities for industrial development, declaring that despite the fact that the French portion of the minette deposits was larger than that involved in the loss of Lorraine in 1871, the iron and steel industry of French Lorraine could not stand comparison with that of German Lorraine. He raises the question as to what the French are going to do with the former German plants of which they have gained possession, but one may overlook the implied insult to French intelligence in contemplating the fact that there falls to France plants and equipment which she may quickly put in operation to aid her in the restoration. Capt. P. E. Dulieux, of the French high commission to the United States, is authority for the statement that of the plants in France which produced the total output of 5,311,000 tons of pig iron in 1913, 80 per cent were destroyed by the Germans. France at that time had 166 blast furnaces, 93 of which were in the eastern district,



HOW FRANCE SURVEYS HER NEW MINERAL WEALTH

This map was prepared by French engineers to show the area and locations of their newly-restored iron, coal and salt deposits

Fluctuations in the Production of Pig Iron

(Gross tons for United States and United Kingdom; metric tons for Germany and France)

	1913	1914	1915	1916	1917	1918
United States	30,966,152	23,322,244	29,916,213	39,434,797	38,647,397	38,500,000
United Kingdom	10,260,315	8,923,773	8,793,659	9,047,983	9,420,254	9,782,525
Germany†	19,291,920	14,391,611	11,789,931	13,259,000	.....	.....
France	5,207,197	*4,500,000	*1,300,000	*1,400,000	.....	.....

†Including Luxemburg.
*Estimated.

How Steel Production Varied During War

	1913	1914	1915	1916	1917	1918
United States	32,321,618	24,206,276	32,151,036	42,773,680	43,500,000	44,000,000
United Kingdom	7,663,876	7,335,113	8,550,015	9,196,457	9,804,079	10,411,701
Germany†	18,958,819	14,973,106	13,258,054	16,035,000	.....	.....
France	4,686,866	*3,250,000	*870,060	*1,000,000	.....	.....

†Including Luxemburg.
*Estimated.

25 in the northern district and 48 in the central, southern and western districts. Of the 166, France retained only 48 furnaces in blast, and had eight others ready to be blown in. If the remainder of her plants were still in workable condition her production would be but 1,062,000 tons of pig iron, while as previously shown, on the basis of her prewar capacity, her production with the additional resources of the territory she acquires as a result of the war should be 11,000,000 tons. In other words, nine-tenths of France's productive capacity, so far as iron and steel are concerned, was destroyed by the Germans. Clawed by her adversary, although victorious, it is apparent France can only hope to realize the benefits of her victory after the lapse of many years.

Still another difficulty which may serve to retard the progress of France toward attaining the full measure of her heritage relates to an adequate supply of coal, without which all her wealth of iron ore would be unavailing. One of the conditions of peace French statesmen have insisted on is the possession of the coal fields of the valley of the Saar, within 50 miles of the mines of Briey from which came 75 per cent of all the iron ore obtained by France. While the actual disposition of the Saar coal fields is still a matter for formal settlement by the peace congress at Versailles, France now considers them as substantially in her possession.

Would Make France Independent

France before the war produced approximately 40,000,000 tons of coal and consumed 60,000,000 tons, importing 20,000,000 tons from Great Britain, Belgium and Germany, the bulk of the amount from the latter country. Other coal deposits have been discovered in France since the outbreak of the war, particularly in the region of Saint Etienne in mid-France, but without the coal of Lorraine, France's future economic position would be hopeless. The coal fields of the Saar valley supplied 17,000,000 tons annually before the war and are said to be capable of producing 20,000,000 tons with improved mining machinery, a suggestion for American manufacturers. The increased supply, therefore, would make France practically independent of foreign nations. The actual reserves in the Saar valley are estimated at 12,500,000,000 tons, enough coal to last France 625 years, and are double those at Valenciennes, the largest deposit within the present boundaries of France.

Meanwhile, it is understood, France will need from 6,000,000 to 8,000,000 tons of steel a year for reconstruction, in addition to her prewar output, which was 4,686,866 tons in 1913.

How France has had to rely on other countries for her iron and steel while holding at bay civilization's foe may be understood from the fact that her imports of iron and steel and their products in 1917 were more than six times greater than similar imports in 1913. In the year before the war the imports were 550,795 tons, but in 1914 before France could recover from the first blow delivered by Germany her imports dropped to 292,970. Then as she summoned all her strength to hold back the enemy, she succeeded in obtaining in 1915 from other countries 1,073,054 tons of iron and steel. Submarines infested the seas, German war lords saw victory secure, but the real barometer of France's fortunes was the register of iron and steel which reached her shores. And despite Germany's rejoicings over the successes of U-boats, France succeeded in obtaining double the amount of iron and steel in 1916 that she obtained in the preceding year, while in 1917 her imports exceeded 3,000,000 tons, excluding those for the American expedition.

Both the exports and imports of England receded considerably during the period of the war, the former dropping from 5,050,919 tons of iron and steel and finished products in 1913 to approximately 2,500,000 tons in 1918 and the imports from 2,342,709 in 1913 to approximately 500,000 in 1918.

On the other hand, the exports from the United States steadily increased from the time war was declared, although the total amount of exports in 1914 was 1,196,081 tons less than in the preceding year. Here is more evidence of the failure of Germany's submarines, for a large proportion of American exports of iron and steel went to hold Germany in leash. France and England may have imposed a barrier between the kaiser and the United States, but the records indicate they might not have done so without American iron and steel. With France's productive capacity paralyzed, the United States sent 3,533,832 tons overseas in 1915, and almost doubled that amount both in 1916 and 1917—a good share of the exports going to France. Of ingots, billets and blooms 2,013,459 tons were exported in 1917, as against 50,496 tons in 1914 and of pig iron 655,265 tons were exported, as against 114,423 tons in 1914. Bar iron exports which amounted to but 5226 tons in 1914 grew to 11 times that figure in 1917 and steel bars from 123,009 tons to 626,465 tons.

Such were the fortunes of war. Stirring military events may have obscured for the time the less spectacular features of deep significance, but now order and stability will come; the future will interpret the real meaning of it all. France looms as a new pillar of industrial strength, Germany's sun appears to be going down; England and the United States have been strengthened. Foundations have been changed, but it remains to be seen how the nations make use of their new opportunities—what structures they will erect.

While American engineers and capitalists are now in France to aid that nation to re-establish herself, the future development of France is not to be made dependant upon American money, experience and energy. There is a great field there for the application of American genius in organization and capitalization, but France has already set up the standard "France for the French" and in the long run, France must go it alone, pitting her ingenuity against the Germans.

Lessons of Co-operation to Endure

Chairman Baruch of the War Industries Board in Message to The Iron Trade Review, Praises Whole-Hearted Service of Iron and Steel Industry

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WHEN the men of the American iron and steel trade read these words of mine the war industries board will be a thing of the past. It was created to aid American industry in the all-important task of doing everything possible to win the war. For the record left behind by the war industries board, the larger credit is due to the industries for the whole-hearted support that they gave. Without the machinery of the nation's business behind it the board could have accomplished little. The outstanding feature of its history was the co-operation of the employers and employes of every trade. We called to Washington the men of different industries and desccribed to them the war needs. We gave them what advice we could; we discussed with them suggestions that they made. The method of meeting each necessity was thus decided upon. The men of industry went home and put the decision into effect. Our requests and suggestions made under such conditions brought results that orders could not have achieved. The spirit of self sacrifice and service with which they were met has written a glorious and indelible page in our country's history. Iron and steel were needed at every step of our war program. In no industry were heavier demands and responsibilities laid and to no group of men—employers and employes—engaged in any line of industry, are greater praise and credit due. To the producers of the raw materials and to the men who turned them into instruments of war, the entire country owes a real debt of gratitude. But in the passing of the war industries board there is more left than a record of things done. Its influence, or rather the influence of what industry in association with it accomplished, will be projected far into the future. Throughout this war we have learned lessons of national and international co-operation that will long survive. This need not stifle competition and we assuredly shall find in each business group a greater interest in the welfare of the industry as a whole, a spirit of mutual helpfulness, and a desire to eliminate undesirable trade practices. And the thrift and economy which the war has taught business will not be forgotten. We are going to save more and waste less than we ever did before. Conservation has become a symbol of American industry. As chairman of the war industries board it is indeed a pleasure—I may say a duty—to record the great and loyal part which industry — employer and employe alike—had in the successful issue of the war.

Bernard M. Baruch

IT is with a feeling of sincere regret that I see this admirable and efficient agency discontinued. It has been a source of great confidence to me in the prosecution of the war that the tasks of the board were in such hands. I want to express my own conviction that the chief cause of the success of the board and of its happy relations with the departments of the government has been your own ability, tact and devotion to duty. (Signed) WOODROW WILSON.

Great Machine Distributes Steel

Government Creates Giant Organization Endowed with Sweeping Powers for Obtaining Maximum Production of Mills and Furnaces and for Applying It to Nation's Cause—Partnership Established with Industry

BY M. L. FEISER

HOW the iron and steel industry of the United States enlisted for the period of the war and what it did in helping to arm and equip the fighting forces of the nation and those of its allies forever will present a glowing page in military and economic history. From an industry that depended only in a very small way upon the world's war machines for its remarkable expansion and development to one whose output at the last was almost exclusively devoted to the combatant forces of half the civilized world there is a record of achievement second to none in the annals of American genius and adaptability.

The many steps that mark the progress of the steelmakers of the United States in turning plowshares into swords involves the accomplishment of what once was regarded as impossible. By working together in harmony, however, the government and the industry, each with the common view to putting down the greatest evil against civilization, have demonstrated to the world what can be done when the effort is made. The skepticism which surrounded the possibility of converting a peace-loving nation into a colossal war power applied equally to this fundamental business of the country, but the passing of 20 months of war has been the most convincing proof of the accomplishment. Figures themselves are the best explanation of what the teamplay of the steel industry and the government accomplished in contributing toward the winning of the war.

Capacity During War Period

In the year just ended the iron and steel interests of the United States had a known normal annual capacity of 41,000,000 net tons of rolled iron and steel. During the period in which this country was at war, from April 6, 1917, to Nov. 30, 1918, or approximately 20 months, at this rate the normal capacity for the rolling mills of the nation would have been 68,000,000 tons of iron and steel. In this time there was allocated through the American Iron and Steel institute 16,750,000 net tons. There was sold to United States indirectly approximately 27,950,000 tons, making the total of allocations and indirect purchases by the government for itself and its allies, approximately 44,700,000 net tons, or nearly two-thirds of the capacity of the industry during the war.

From these figures it will be noted that three-eighths of the government business was allocated directly and five-eighths purchased through steel consumers who turned the volume into fabricated products. Of the 44,700,000 tons, it is estimated 6,700,000 tons was for the account of the various allied governments while the remainder, 38,000,000 net tons, was for the war program, direct and indirect, of the United States. This is borne out in study of the actual shipments of rolled iron and steel products in the 45 weeks ending Nov. 9, 1918. In this period these shipments approximated 30,000,000 net tons, of which the American government received 17,000,000 tons and the allied governments 3,000,000 tons. This left 10,-

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WAR INDUSTRIES BOARD

Standing, left to right: H. P. Ingels, Edwin B. Parker, George N. Peek, J. Leonard Replogle, Alexander Legge, Maj. Gen. George W. Goethals, A. C. Ritchie. Seated, left to right: Rear Admiral F. F. Fletcher, Robert S. Brookings, Bernard M. Baruch, Hugh Frayne

000,000 tons for essential domestic purposes and export.

While recording the industry's production achievement, it might be well to note the relation of the two groups of producers of the country, the subsidiary interests of the United States Steel Corp. and the so-called independent steel companies. Of the normal annual capacity of 41,000,000 net tons, 56 per cent represents the aggregate capacity of all companies outside the steel corporation. During the years 1915, 1916, 1917 and 1918, with very little variation for any one year, the aggregate shipments from these companies approximated this percentage. In the first 11 months of the past year shipments of the companies other than the corporation's subsidiaries actually were 59 per cent of the industry's output.

Production of pig iron in 1918 is confidently expected to have been something in excess of the 38,000,000-ton mark, or slightly better than the output of 38,164,976 tons in 1917. The blast furnaces of the country in the 20 months ending Dec. 1 last, or since a few days before the United States' declaration of war against Germany, produced 64,106,201 tons of iron. When the difficulties which beset the industry during this period are recalled, the influenza epidemic, transportation tieups, extremes of weather, labor shortage, with resulting shortages of cars and coke, the achievement may be considered remarkable. In view of this volume of iron some surprise may be expressed over the fact that the allocations of pig iron by the government during the war aggregated slightly over 2,000,000 tons. Iron allocations, like steel priorities, were made only when producers had overcome the difficulty in obtaining raw materials. Allocations of course were made largely to these consumers who are regular buyers of iron. These consumers in 1917 received approximately 11,000,000 tons from the furnaces which represents about the normal merchant iron market of the country.

Industry Ready to Serve

With this small volume of iron allocations involving approximately 250,000 tons for export to the allied government and with steel commitments for the allies estimated at 6,700,000 net tons, it will be of interest to note the tonnages shipped abroad during the war and in the prewar period. The war trade board's figures have not been brought down to date but in the year ending last June 30, 5,711,545 tons of iron and steel were exported from the United States and in the year before that the total was 6,874,138 tons. These figures do not include the vast tonnages of steel which were shipped to the American expeditionary forces and which did not pass through the United States custom houses. But of these recorded volumes, 2,942,061 tons was exported to the European allies in 1918 and 3,776,263 tons in 1917. Further dividing these figures, it is interesting to note that of the 1918 shipments to the allies 203,547 tons were of pig iron and 2,738,514 tons of steel, and in 1917 547,286 tons represented pig iron exportations and 3,128,977 tons steel. The decline in the 1918 exports over those of 1917 was due to the absorption of considerable of this tonnage available for foreign distribution and of additional tonnages by the American troops.

This unparalleled performance of the iron and steel producers of the United States, the conversion with continuous production of a peacetime industry to a war basis, came through the system set up by the government with the trade's co-opera-

PRIORITIES BOARD

Standing, left to right: T. F. Whitmarsh, food administration; T. C. Powell, inland traffic; Charles R. Piez, Emergency Fleet corporation; P. F. Noyes, fuel administration; Felix Frankfurter, labor; C. M. Woolley, war trade board; George N. Peek, allied purchasing commission, vice Alexander Legge, abroad. Seated, left to right: Edward Chambers, railroad administration; Maj. Gen. George W. Goethals, army; B. M. Baruch, war industries board; Edwin B. Parker, priorities commissioner; Rear Admiral F. F. Fletcher, navy

PRICE FIXING COMMITTEE
(Upper)

Standing, left to right: R. V. Norris, Commander John M. Hancock, W. W. Phelps, Lieut. Col. R. H. Montgomery, H. C. Stuart, H. A. Garfield. Seated, left to right: William B. Colver, B. M. Baruch, R. S. Brookings, Hugh Frayne, Dr. F. W. Taussig

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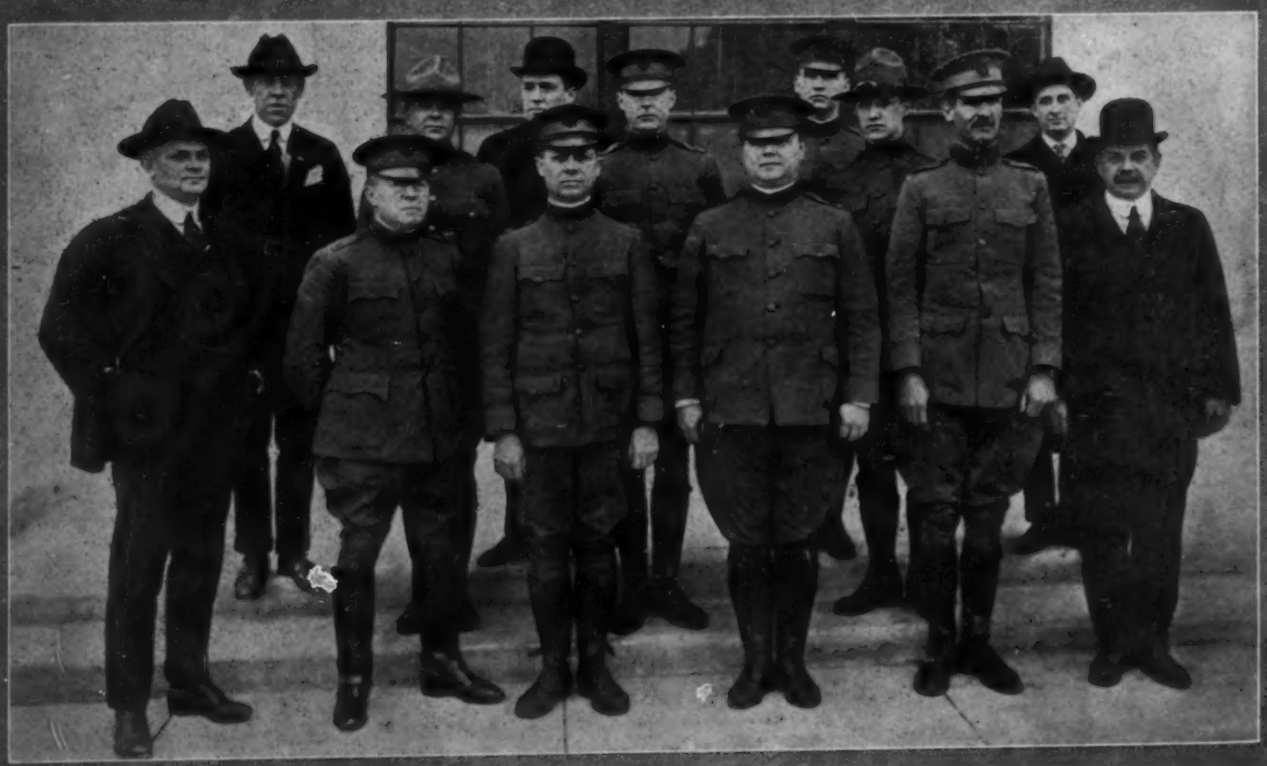
ARMY STEEL SECTION (Lower)

Left to right: George W. Welles, H. E. Derbyshire, Major G. R. Tuska, Captain George W. Wallerich, W. C. Bogue, Major W. C. Coryell, Captain W. B. Curtis, Major W. M. MacCleary, Lieutenant H. F. Murphy, Private W. B. Pfaff, Major S. A. Tucker, G. W. Hite, W. A. Graham

STEEL COMMODITY SECTION AND SOME OF DIRECTOR REPLOGLE'S ASSISTANTS
(Left)

Standing, left to right: J. C. McLaughlan, Capt. D. E. Sawyer, Frank E. Thompson, Frank Purnell. Seated, left to right: H. B. Spencer, Major W. M. MacCleary, J. Leonard Replogle, Lieut. Com. S. R. Fuller Jr., H. S. Grimes



PIG IRON SECTION
(Upper)

Standing, left to right: L. R. Smith, S. R. Leonard, B. S. Stephenson. Seated, left to right: Leonard W. Williams, J. C. McLauchlan, J. Leonard Replogle, J. W. Dickson

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NAVY STEEL SECTION (Lower)

Front row, left to right: Com. J. M. Hancock, Rear Admiral Samuel McGowan, Rear Admiral C. J. Peoples, Lieut. Com. S. R. Fuller Jr. Middle row, left to right: Ensign J. F. Howard, Lieut. L. Moyer, Lieut. C. E. Sandgren, Lieut. J. A. Green, Ensign P. W. Frieder, Ensign E. G. Sutcliff, Ensign W. W. Sebald, Ensign C. W. Windeknecht. Back row, left to right: A. F. Sprunck, F. Kennedy, A. A. Aronson, J. K. Bayliss, W. E. Gontier

WAR TRADE BOARD
(Left)

In front, left to right: Frank C. Munson, Vance C. McCormick. Back row, left to right: Albert Strauss, Dr. Alonzo E. Taylor, Thomas L. Chadbourne, Edwin F. Gay, Clarence M. Woolley, John Beaver White

Meeting Which Sealed End of Federal Control

CONFEREES AT LAST MEETING OF REPRESENTATIVES OF STEEL INDUSTRY AND GOVERNMENT, WASHINGTON, DEC. 11

1, J. A. O. Preus; 2, Commander John M. Hancock; 3, H. J. Watt; 4, E. V. Norris; 5, W. W. Phelps; 6, Maj. W. M. McCleary; 7, F. A. Wilds; 8, Leonard W. Williams; 9, Albert Schneider; 10, J. C. McLauchlan; 11, Andrew L. Pugh; 12, H. S. Grimes; 13, A. H. Woodward; 14, J. V. W. Reynders; 15, F. J. Herman; 16, John B. Newton; 17, James B. Bonner; 18, W. N. Coffin; 19, M. C. Dizer; 20, A. F. Huston; 21, F. J. Hall; 23, James A. Campbell; 23, Francis Walker; 24, W. W. Wooster; 25, W. M. Wells; 26, Major Ralph D. Magoffin; 27, Henry C. Stuart; 28, Dr. F. W. Taussig; 29, Hugh Frayne; 30, Willis L. King; 31, John A. Topping; 32, James A. Farrell; 33, L. E. Block; 34, Robert S. Brookings; 35, H. G. Dalton; 36, E. H. Gary; 37, E. G. Grace; 38, J. A. Burden; 39, B. M. Baruch; 40, E. A. S. Clarke; 41, J. Leonard Replogle; 42, Lieut. Col. R. H. Montgomery; 43, William B. [illegible]er.

tion. This arrangement involving the distribution and manufacture of huge tonnages of material was brought about through the creation of a centralized purchasing system, the recognition of a centralized selling agency and the establishment of fixed prices with which to complete the transactions. Having determined these points, both the government and the industry were able to proceed with the business in hand without the usual details of buying and selling.

The American Iron and Steel institute, upon the suggestion of Secretary of War Baker and Secretary of the Navy Daniels, opened a suite of offices in the Wilkins building in Washington and placed them in charge of James B. Bonner, manager of sales in the Philadelphia district for the United States Steel Corp., whose activities for years had kept him in close touch with the government. Thus the industry on the very day war was declared was ready to serve the country. How this service could be rendered most efficiently was, of course, a question that neither the government nor the trade could determine at once.

Law prescribed certain purchasing practices which had to be followed even in time of emergency. Facing this situation, but with the main departments preferring to clear their purchases through a co-ordinated source, the various government buying agencies were slow to take advantage of the industry's co-operation and continued to make most of their contracts without allocating the materials through the institute. This gave Mr. Bonner's office little to do at first. Later, when the system of buying and distribution was made uniform for the government and the allied commissions in this country, Mr. Bonner required more of the institute's authority. Accordingly he was made vice chairman of the committee on distribution and his working organization was increased materially.

Replogle Appointed

The government, slow in development of its part of the plan, five months after the institute began functioning took its first step in organizing the buying department. Bernard M. Baruch, then chief of the raw materials division of the war industries board and destined to become its chairman, called to Washington J. Leonard Replogle, chairman of the board of directors of the Wharton Steel Co., as his steel advisor. Mr. Replogle later became director of steel supply in which capacity he served as head of the steel commodity section which was composed of Maj. W. M. MacCleary of the army, Lieut. Com. S. R. Fuller Jr. of the navy, H. S. Grimes of the Emergency Fleet corporation and H. B. Spencer of the railroad administration.

These section members, each with a staff proportionate in size to the demands to be made of the industry, cleared their requirements through Mr. Replogle, who also organized a large staff. Mr. Replogle, grouping the orders and keeping an eye on production, allocated these requirements to the trade through Mr. Bonner. Mr. Replogle had nothing to do with the making of contracts for the government nor had Mr. Bonner for the industry. These two men brought the purchasing departments and the mills together.

This arrangement, while saving time by facilitating the handling of the large commitments of steel, needed further ramifications and early in its operation found use for the priorities administration created by the war industries board. This function of dispensing priority of production and delivery when the steel industry first came face to face with its methods of procedure was under the commissionership of Edwin B. Parker, an attorney and former judge from Houston, Tex. Later the priorities division became one of the most important divisions of the board. Mr. Replogle at first also was a member of the priorities committee but when the duties of the steel division as well as those of the priorities division became so great, H. H. Barbour, the Lackawanna Steel Co.'s manager of sales in the New York district, was made the steel representative in the priorities administration.

The operation of the priorities system did not impress itself appreciably upon the steel industry and other trades of the country until the latter began to feel the real pinch of war. This came last spring when General Pershing placed all his men and the country's resources at the service of Marshal Foch. The French commander lost no time in taking advantage of this opportunity and soon the American and allied steel requirements began to increase at a rapid rate. This meant more extensive operation of priorities and the committee issued rules and regulations and supplements so fast that mills actually had to designate certain officials to study them and put them in effect. This brought about the desired results, however. Working with the priorities committee in this common effort were the conservation division which showed where to cut down waste in manufacture and in the use of materials; the resources and conversion division which located plants that could be adapted to more essential war production; the facilities division which studied plant

THE CENTER OF WAR-TIME GOVERNMENTAL REGULATION OF THE IRON AND STEEL INDUSTRY. COUNCIL OF NATIONAL DEFENSE BUILDING, WASHINGTON; INCLUDING OFFICES OF WAR INDUSTRIES BOARD

equipments and extensions; the requirements division, and numerous other branches of the board. These all served their purpose and while they have passed out with the war industries board many of the practices in economy they outlined may continue to be applied, because, as is generally conceded, the war has taught many lessons of thrift and efficiency.

While these departments were operating the government and the industry counseled one another as to still better and more voluminous production. Many conferences were held, chief among which were the "100 per cent pledge" meeting in New York and the "resolutions of June 5" meeting in Washington, where, for the first time, the purposes for which the mills should roll steel more clearly were defined.

The feature of government control which perhaps held the greatest interest not only for the producers but for the buyers was that of price fixing. A few weeks after the institute had been urged to take charge of steel distribution the government approached the makers on the question of prices. No schedules were adopted but soon after the President instructed the federal trade commission to conduct an investigation of the cost of steelmaking. After reports had been submitted, the war industries board, then part of the council of national defense, at the suggestion of the President summoned representatives of the steel industry to Washington to discuss prices. That memorable meeting was held Sept. 21, 1917, and on Sept. 24 the President announced the agreed maximum prices on iron ore, coke, pig iron, steel bars, plates and shapes. On Oct. 11 he announced prices on other steel products, billets, blooms, slabs, sheet bars, wire rods, shell bars and skelp. On Nov. 5 sheets, tin plate, wire, cold-rolled steel and scrap prices were fixed. The final act of the price committee as far as the iron and steel industry is concerned took place Dec. 11, of this year. When the representatives of the industry assembled to consider first quarter prices, it was announced that the committee would terminate its existence Jan. 1. On that date consequently government market control of iron and steel automatically came to an end.

The co-operative system of steel regulation was not without its critics and long before the plan had been tried a bill was introduced in congress by Senator Atlee Pomerene of Ohio to authorize the President to take over and operate every blast furnace and steel works in the country. It happened that the day of the first steel price conference was also the day of the first, and last, hearing on the Pomerene bill. Steel men had been invited to attend the hearing but the only witnesses who appeared were members and economists of the federal trade commission who tried to have written into the measure provisions for the abrogation of contracts. Both the bill and the commission's recommendations were pigeon-holed in subcommittee.

Sometime before it was officially announced that Mr. Replogle had been appointed director of steel supply the iron and steel manufacturers began to receive from the war industries board requests for weekly reports on steel production. These requests in addition to those from the federal trade commission and other government statisticians burdened the mills with additional clerical work, but it soon became apparent that the board's reports were essential. The early information blanks asked certain facts in connection with the production of projectile steel, sheared and universal plates, merchant bars, structural shapes, sheets, rails and seamless tubes. Then were added blanks on tin plate, tubular products, wire rope, wire and wire products and all steel products.

The mills have been reporting regularly on all of these products since the middle of last January and from the tabulations made in the statements that portion of the service the industry rendered may be chronicled. Based upon available records and taking the most authoritative estimates, the figures here presented will afford a definite idea how high the iron and steel industry of the United States was geared to war production when the German military machine collapsed.

Germany Entertains Fatal Delusion Over American Industrial Power

As much tonnage approximately as the whole German steel industry including Luxemburg during its four most productive years before the war was able to bring forth, was supplied by American works for fashioning the tools of victory during the 20 months in which the United States was engaged in the war.

While a complete and definite record has not been drawn and may never be, The Iron Trade Review *learns from authoritative sources that the quantity of iron and steel passing through the regularly organized channels of war distribution in that period was approximately 45,000,000 net tons. Of this amount 16,750,000 tons was allocated through the American Iron and Steel institute. The remaining 27,950,000 tons was made up of indirect purchases by the government for itself and for its allies. This great tonnage was subtracted from commercial consumption and diverted to the filling of the demands of the armies and navies overseas. The aggregate represented about two years' production of steel in the United States at the rate possible prior to the war. Manifestly even its staggering proportions fall considerably short of expressing the full tonnage that was supplied by the works of this country since April, 1917. The indirect requirements of the conflict which were to be found in practically every line of American industry in all probability are not represented completely in the total tonnage allocated or purchased by the government.*

In 1910 the steel works of Germany including Luxemburg produced 13,698,638 metric tons of ingots, in 1911, 15,019,333 metric tons, in 1912, 17,301,998 metric tons and in 1913, 18,958,819 metric tons, a total of 64,978,788 metric tons or approximately 43,500,000 tons of finished rolled products. The best obtainable records since then show that in 1915 the German output of ingots was only about 13,000,000 tons, representing approximately 10,000,000 tons of finished rolled products and in 1916 slightly more. The presumption is raised that this was an amount sufficient for the maintenance of the well developed military machine of the kaiser in view of the fact that Germany was shut off from her extensive export markets by the allied blockade. Her exportations of steel before the war were approximately 5,000,000 tons of finished product annually.

When the military strategists of Berlin with a display of sublime egotism or colossal stupidity fatuously decreed that the United States, notoriously unprepared, could be challenged safely because it could not become an important war factor in time, they pronounced their own downfall. Prepared or not for war, the blast furnaces and steel works of this country almost from the first day the United States was at war were able to pour a rising flood of munitions behind the allied battlelines at France which unquestionably was an important factor if not the most important single element in turning the tide. The cold, impressive figures of the tonnage furnished by the American iron and steel plants bespeak alike a tribute to the contribution toward victory made by the industry and the fatal error of the German warlords in ignoring the great industrial power of this country, as a military asset.

American Steel Crushed the Enemy

Steel Director Replogle Declares to The Iron Trade Review That Flood from Works Driven Home by United Effort is Effective Factor

AT the meeting of iron and steel manufacturers. held some weeks ago in Judge Gary's office when the 100 per cent pledge was adopted, I think a much more clear understanding of the necessities of the war situation was reached. It now is incumbent upon me to say, and I do say with the greatest of pleasure, that today 100 per cent of the steel manufacturers of the country are doing their utmost in the nation's war effort and there is not a single exception to this rule. You are all doing wonderful work, both patriotic and unselfish and when the complete history of this war will have been written, the work of the steel manufacturers will stand out.
New York, May, 1918.

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I HAVE often felt that one of the great achievements of history was accomplished at the meeting of the steel manufacturers and the war industries board in September, 1917. Manufacturers realized fully that, due to abnormal war conditions prices had risen entirely too high. I for one, do not think our President has made many more important decisions than that our allies in this fight were entitled to the same prices on war materials as our own government. The prices as officially approved by the President, involved a reduction, in some cases of 75 per cent from the former ones, but I think today they are considered by all of you fair and reasonable.
New York, May, 1918.

THUS, the war comes to an end." When President Wilson, in his address to congress Nov. 11, 1918, uttered these words, the duties and responsibilities assumed by the steel industry of this country and so energetically and ably fulfilled, were brought to an end. There were many conflicting, contributing elements to the successful result, but everyone will agree that one of the principal factors in the decisive result was the enormous tonnage of steel supplied by the industries of the United States and amassed on the western front in such quantities as enabled Marshal Foch to crush the enemy with the weight of metal.

When the history of the greatest and most terrible of all wars is written, there will be no brighter page than those devoted to the accomplishments of the steelmakers of the United States who eliminated all ideas of commercialism from their operations and patriotically and energetically set themselves to the gigantic task of meeting all emergencies and of co-operating with the government in every possible way. It has been a very great honor and privilege to have been associated with them.

J. L. Replogle

War Writes Steel's Brightest Page

Patriotic and Whole-Souled Effort of Entire Industry Meets Every Demand of Victory—Capacity of Works to Last Ton Put at Nation's Call—Achievement of American Iron & Steel Institute is Historic

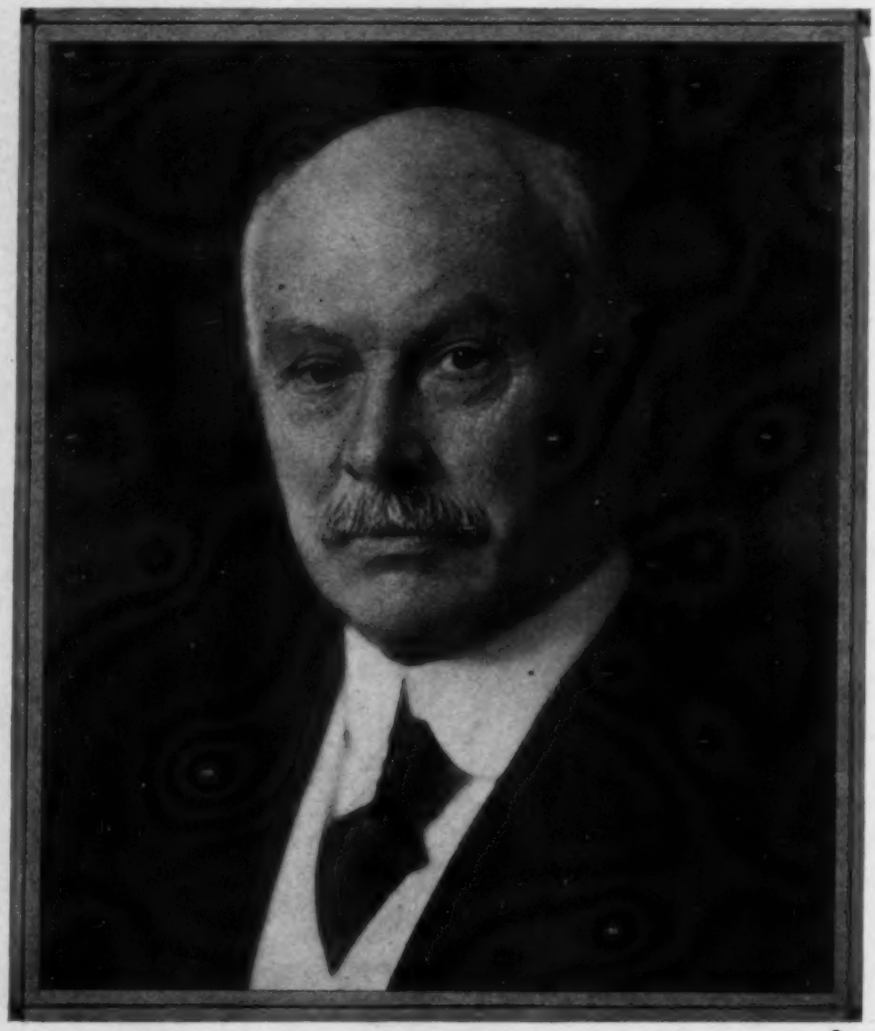
BY E. C. KREUTZBERG

NO achievement in the conduct of the war contributed more to its successful conclusion than the harmonious co-operation of the iron and steel industry, through the medium of the American Iron and Steel institute, in meeting all demands which were made upon it by the government. It strained every nerve to increase output, it increased capacity and altered its products as directed, and with total disregard of selfish considerations, sold its output to the government, to the public and to the allies at prices which not only were far below the levels which would have been dictated by the law of supply and demand but which in some cases actually were lower than the cost of production. J. Leonard Replogle, director of the division of steel supply of the war industries board, estimated shortly after the war officially was declared by President Wilson to be at an end that the iron and steel industry had lost at least $3,000,000,000 by selling its products at agreed prices. That is, the United States and the allies saved a sum of at least this size which would have gone to the iron and steel industry if the latter had based its prices in the usual way upon purely market conditions.

A truly remarkable story is that of the iron and steel industry's war service. Its most singular feature is that the sacrifices which characterized its contribution to the winning of the struggle were voluntary. And this spirit of voluntary sacrifice was reflected not by a few but by all those participating in the control of the industry. Presidents of companies had no difficulty in explaining satisfactorily to directors and stockholders the reasons for the tremendous shrinkage of profits which followed the fixing of prices by agreement. Even where companies considered that they were unjustly dealt with, they surrendered their grievances when it was thought that such action would benefit the cause as a whole. Perhaps the best illustration of the unanimity of purpose that prevailed is the fact that the self-imposed control which the iron and steel industry maintained during the war remained lodged in the same hands at the end of the war that held it originally.

Among the tributes which have been called forth by the remarkable performance of the industry throughout the war is an appreciation from the British ambassador to this country, who said that the war program never once was held up due to a lack of steel. Members of the war industries board have not hesitated repeatedly to express their deep gratification over the wholehearted co-operation which they have received from the industry. And not a single word of reproach over its conduct has been directed against it from any responsible quarter. Best of all, from the standpoint of the industry itself, is the appreciation in the public mind of its value in a national sense; furthermore, the service which it has rendered to the nation has done much toward wiping out the old prejudice against big business interests.

When the United States became a belligerent in April, 1917, it did not become apparent at once that our war re-



E. H. GARY
Chairman, Committee on Steel and Steel Products, American Iron and Steel Institute

quirements would take more than a small portion of our iron and steel output. In fact, some of the best informed men in the industry then were of the opinion that the United States Steel Corp. alone could produce in a week or thereabouts all of the steel that the country could use for war purposes in a year. Therefore, not much thought was given at first to the probability that it might become advisable to fix prices generally and definitely. On March 28, Bernard M. Baruch, then chairman of the national council of defense, met the general committee of the American Iron and Steel institute, and placed before that body a request from Josephus Daniels, secretary of the navy, for 172,174 tons of steel for the naval construction program, to be paid for on the basis of the average prices over the preceding 10-year period. These averages figured out as follows, on a Pittsburgh basis: Steel bars, 1.4989c; shapes, 1.5536c; plates, 1.621c; iron bars, 1.3866c; No. 28 gage black sheets, 2.1966c. In view of the failure to realize the coming extent of the war needs, it was the opinion of the general committee of the American Iron and Steel institute that the industry, from a patriotic standpoint, would be glad to furnish this steel to the government without profit. It objected to settlement on the 10-year average basis, however, due to the rapidly advancing cost of labor and materials. Therefore, in a conference with Secretary Daniels on April 16, James A. Farrell, president of the United States Steel Corp., in his capacity as vice chairman of the institute committee, concluded an agreement with the former by which the steel industry was to supply the requirements of the naval program at 2.50c, Pittsburgh, for bars and shapes and at 2.90c, for plates. By that time the naval requirements had risen to between 500,000 and 600,000 tons, but the needs of the army, to which these special prices also were to apply, were inconsiderable. Altogether, these prices were paid on approximately 610,000 tons, which was distributed among various producers in accordance with their capacity. Incidentally, the saving which the government effected by purchasing this steel at the special prices was more than $15,000,000. The market prices in effect on the day Mr. Farrell visited Washington were 4.50c, Pittsburgh, on plates, 3.60c on shapes and 3.35c on bars. It is of interest to note that the first order in connection with these original war requirements of the government was placed April 27, with the Illinois Steel Co.; it involved 7000 for a pontoon to be erected at Mare Island. The final orders comprising the original 610,000 tons were distributed on July 25, 1917.

The disposition to sell to the government at the lowest possible prices led to the establishment, during the latter part of April, of special prices on government requirements in sheets and other steel products. These were much lower than the prices prevailing in the general market but they were applied only to the comparatively small tonnages which the government then was placing. The quoting of such special prices, it was felt at that time, answered all the needs of the situation and no one then had any inkling of the fact that the vast magnitude which later was to be assumed by the war preparations would result in action of an unprecedented character. The development which first gave real impetus to the movement that culminated in price fixing by agreement, was the controversy between Chairman William Denman of the United States shipping board, and Gen. George W. Goethals as to whether the government should concentrate on the building of wood or steel vessels. Gen. Goethals on May 29 announced that he had accepted the offer of the steel industry to furnish and fabricate the steel for 3,000,000 deadweight tons of steel ships within 18 months, and he named provisional prices of 4.25c, Pittsburgh, for plates, 4.00c for shapes and 3.75c for steel bars, subject to change in accordance with the finding of an investigation of costs to be undertaken by the council of national defense. These prices named tentatively by Gen. Goethals with the approval of the steel industry, again reflected the reasonable views of the steelmakers with reference to government requirements, since at that time producers were having no difficulty in obtaining in the regular channels of business 7.00c to 8.00c, Pittsburgh, for plates, 4.50c for

E. A. S. CLARKE
Secretary, Committee on Steel and Steel Products, American Iron and Steel Institute

Men Who Co-ordinated Iron and Steel in War

SUBCOMMITTEE ON STEEL AND STEEL PRODUCTS

CHAIRMAN, E. H. GARY, chairman United States Steel Corp.; vice chairman, J. A. Farrell, president United States Steel Corp.; secretary, E. A. S. Clarke, president Lackawanna Steel Co.; assistant secretary, H. H. Cook, American Iron and Steel institute; J. A. Burden, president Burden Iron Co.; H. G. Dalton, Pickands, Mather & Co.; A. C. Dinkey, president Midvale Steel & Ordnance Co.; E. G. Grace, president Bethlehem Steel Corp.; A. F. Huston, president Lukens Steel Co.; W. L. King, vice president Jones & Laughlin Steel Co.; C. M. Schwab, chairman Bethlehem Steel Corp.; J. A. Topping, chairman Republic Iron & Steel Co.; James A. Campbell, president Youngstown Sheet & Tube Co.; L. E. Block, vice president Inland Steel Co.

SUBCOMMITTEE ON DIFFERENTIALS

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SUBCOMMITTEE ON SHEET STEEL

Chairman, W. S. Horner, president National Association of Sheet and Tin Plate Manufacturers; Walter C. Carroll, American Sheet & Tin Plate Co.; Charles O. Hadley, Alan Wood Iron & Steel Co.

SUBCOMMITTEE ON FERROALLOYS

Chairman, J. A. Farrell, president United States Steel Corp.; secretary, A. A. Fowler, Rogers, Brown & Co.; C. A. Buck, vice president Bethlehem Steel Corp.; E. A. S. Clarke, president Lackawanna Steel Co.; D. G. Kerr, vice president United States Steel Corp.; E. J. Lavino, E. J. Lavino & Co.; A. D. Ledoux; Frank Samuel; E. F. Price, Electro Metallurgical Co.; F. W. White, president Mutual Chemical Co.

SUBCOMMITTEE ON PIG IRON, IRON ORE AND LAKE TRANSPORTATION

Chairman, H. G. Dalton, Pickands, Mather & Co.; Pittsburgh representative, C. D. Dyer, W. P. Snyder & Co.; eastern representative, Leonard Peckitt, president Empire Steel & Iron Co.; Buffalo representative, W. T. Shepard, Rogers, Brown & Co.; southern representative, A. H. Woodward, Woodward Iron Co.; Frank Billings, Tod-Stambaugh Co.; H. Coulby, president Pittsburgh Steamship Co.; Frank B. Richards, M. A. Hanna & Co.; H. Wilkins; secretary, Amasa S. Mather, Pickands, Mather & Co.

SUBCOMMITTEE ON TUBULAR PRODUCTS

Chairman, James A. Campbell, president Youngstown Sheet & Tube Co.; H. A. Beale Jr., president Parkersburg Iron Co.; L. M. Johnson, general manager A. M. Byers Co.; Anson Mark, vice president Mark Mfg. Co.; George Mattheson Jr., vice president and general manager Spang, Chalfant & Co., Inc.; W. H. Rowe, president Pittsburgh Steel Co.; E. Worcester, first vice president National Tube Co.

SUBCOMMITTEE ON TIN PLATE

Chairman, J. I. Andrews, general manager sales American Sheet & Tin Plate Co.; E. R. Crawford, president McKeesport Tin Plate Co.; E. T. Weir, president Weirton Steel Co.

SUBCOMMITTEE ON PIG TIN

Chairman, John Hughes, assistant to president United States Steel Corp.; E. R. Crawford, president McKeesport Tin Plate Co.; John A. Frye, general purchasing agent American Can Co.; G. D. Dorsey, assistant manager metal department National Lead Co.

SUBCOMMITTEE ON WIRE PRODUCTS

Chairman, F. Baackes, vice president and general sales agent American Steel & Wire Co.; George A. Mason, manager of sales Jones & Laughlin Steel Co.; John C. Neale, vice president and general manager of sales Midvale Steel & Ordnance Co.; J. E. Frederick, secretary Kokomo Steel & Wire Co.; H. Sanborn Smith, vice president and general manager sales Gulf States Steel Co.

SUBCOMMITTEE ON WIRE ROPE

Chairman, Karl G. Roebling, general sales manager John A. Roebling's Sons Co.; F. Baackes, vice president and general sales agent American Steel & Wire Co.; John J. Broderick, president Broderick & Bascom Rope Co.

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Chairman, W. Vernon Phillips; secretary, C. A. Barnes, chief of the bureau of inspection and also secretary of the American Board of Scrap Dealers; sellers of scrap, Charles Dreifus, Charles Dreifus & Co.; Joseph Michaels, Hyman-Michaels Co.; Eli Joseph, Joseph Joseph & Bros.; manufacturers of open-hearth steel, H. B. Spackman, Lukens Steel Co.; W. M. Tobias, Bethlehem Steel Co.; Charles E. McKillips, Carnegie Steel Co.; manufacturers of bar iron, John C. Brown, Lavino Furnace Co.; Walter C. Ely, Highland Iron & Steel Co.; rerolling mills, D. C. Schonthal, West Virginia Rail Co.; Arthur S. Hook, Calumet Steel Co.; steel casting and electric-furnace interests, T. E. Moritz, American Steel Foundries; Rodney Thayer, Penn Seaboard Steel Corp.; manufacturers of crucible steel, J. S. Pendleton, Carpenter Steel Co.; manufacturers of gray iron and malleable castings, B. D. Fuller, vice president and manager Uptegraff Interests; Pacific coast, Emory E. Smith.

SUBCOMMITTEE ON CAST IRON PIPE

Chairman, L. R. Lemoine, president United States Cast Iron Pipe & Foundry Co.; W. H. Hulick, president Warren Foundry & Machine Co.; A. M. Campbell, chairman Cast Iron Pipe association.

SUBCOMMITTEE ON TRAFFIC CONDITIONS

Chairman, Andrew G. Young; F. T. Bentley, traffic manager Illinois Steel Co.; L. C. Bihler, traffic manager Carnegie Steel Co.; J. A. Coakley, division freight agent American Steel & Wire Co.; H. C. Crawford, traffic manager Cambria Steel Co.; John A. Gross, traffic manager Bethlehem Steel Co.; W. H. Higgins, traffic manager Wheeling Steel & Iron Co.; W. E. Howes, traffic manager Lackawanna Steel Co.; C. L. Lingo, traffic manager Inland Steel Co.; H. R. Moore, traffic manager Republic Iron & Steel Co.; Charles H. Muse, superintendent transportation Frick Coke Co.; J. L. Roney, traffic manager American Rolling Mill Co.

shapes and 4.00c for steel bars. Although it was well understood that the prices named were only of a tentative character, Chairman Denman refused to sign the contracts for the vessels, insisting that the limit should be 2.90c for plates and 2.50c, for shapes and bars, the special figures agreed to in April in connection with the 610,000 tons for the navy and the army. In order not to hold up work on the shipping program, the committee of the American Iron and Steel institute agreed to the naming of a provisional price of $56 per ton in connection with certain contracts, including one for 10 vessels to be built by the Downey Shipbuilding Corp. If this steel had been sold at open market prices it would have commanded around $130 per net ton.

facts. A peculiar feature in connection with these aspersions was that they were cast in all good faith, as proved later by the willingness of these same officials to act fairly when they had been won over to recognition of the facts. The agitation on the subject of prices caused President Wilson in the latter part of June, 1917, to order the federal trade commission to begin work at once upon an investigation of the cost of producing iron and steel.

A Market Without Top

In the iron and steel industry itself, it was recognized that the great excess in demand over supply would continue to swing prices upward to new high levels. Some of the price ranges which prevailed in July, 1917, were as follows: Tank plates, 10c to 12c; steel bars, 4c to 6c; No. 10 gage blue annealed sheets, 8c to 9c; structural shapes, 4.50c to 6c; No. 2 foundry iron, $50 to $55. It was impossible to form any kind of an opinion as to where values would go if they were left to be determined by the law of supply and demand. The possibilities of the situation, however, were apparent from the fact that in the civil war, despite the much greater purchasing power of the dollar at that time, foundry iron brought on an average $73.63 per ton at Philadelphia. Most of the leaders in the industry realized the dangers from unwarrantably high prices, but many were opposed to the suggestions for fixed prices. In the first place they considered price fixing to be in direct violation of the Sherman law. Secondly, they considered that the only true economic determinant was the relation of demand to supply and that the substitution of artificial barriers would result in an impossible economic situation. Then too, they feared the radical views which were held in so many quarters would result in the establishment of prices either ruinously low or not being sufficiently flexible to alow for rising costs of labor and materials. The question of profits did not enter into these opposing arguments in any way. In fact, the iron and steel industry was a unit in recommending that excess profits be taken by the government through the medium of taxation.

The hue and cry over the subject of prices, however, was looked upon by sound and patriotic thinkers as the wrench which was on the point of being thrown into the machinery for winning the war. Manufacturers keenly realized that the war was one of resources and tonnage production, and that no chances must be taken in permitting the efficiency of industrial organizations to be impaired by unwise governmental actions. Therefore, leaders in the iron and steel industry began to make up their minds as to the course it was advisable to pursue. Their feelings at that time were very well put by an influential manufacturer who on June 25, 1917, expressed himself as follows:

> *No one is more strongly opposed to government ownership than I am, but if something be not done soon, it is going to come about. I mean that the government during the war will take over all kinds of private establishments. A more direct policy between the business people and the government as to*

FRANK BAACKES
Chairman Subcommittee on Wire Products

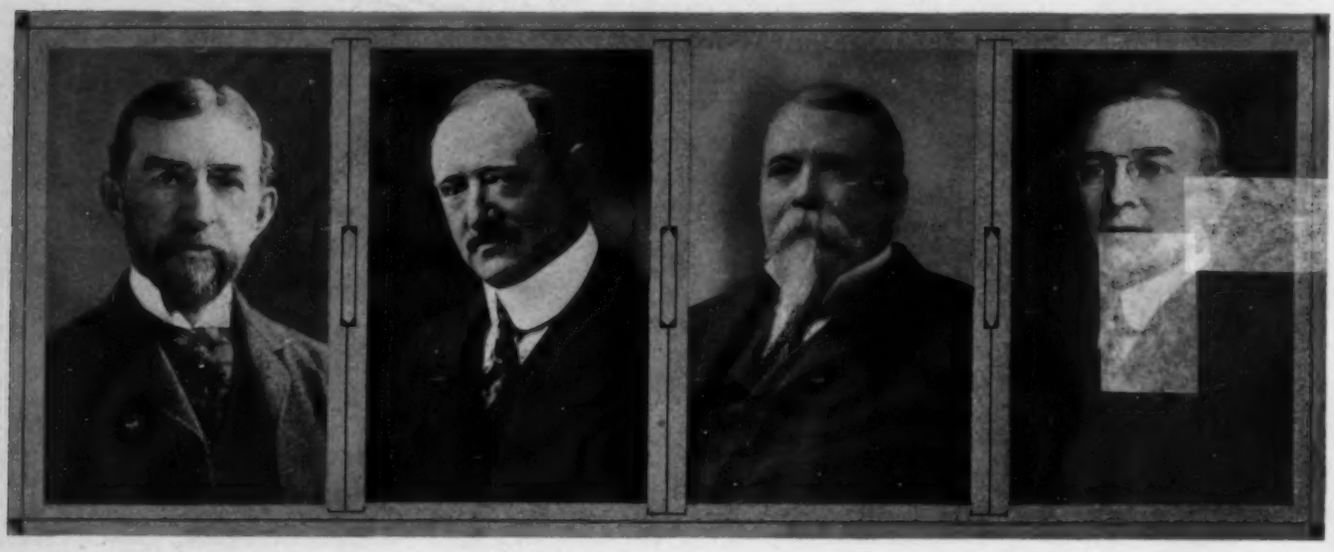
C. M. SCHWAB
Member Committee on Steel and Steel Products

JAMES A. FARRELL
Chairman Subcommittees on Distribution, Differentials and Ferroalloys

JAMES A. CAMPBELL
Chairman Subcommittee on Tubular Products

There followed a period of uncertainty and anxiety during which radical elements both in and out of the government service proposed to do all sorts of things, from the fixing of prices and the regulation of distribution, to the taking over of whole industries. Controversies were bandied about by political demagogues who made capital out of prices on all sorts of materials and fed a growing fear throughout the country that there was profiteering at the expense of the government. No matter how slight were the differences between government officials and manufacturers as to remuneration, they were magnified and given such a color as to create the belief that wholesale advantage was being taken of the government. High government officials made accusations and intimations which had no foundation except in their ignorance of the true

prices must be adopted at once and must be firm. Business should come out flatly for reasonable prices for supplies it sells to the government. In my estimation, some supplies have been sold to the government too cheaply, and when new arrangements are being made for purchasing added supplies so sold to the government it is inevitable that higher prices must be obtained, and that plainly indicates another controversy. But, at the same time, the business interests must not ask the government prices that are too high. They should sell to it at lower figures than are obtained in the open market, but I am emphatically opposed to anyone making excess profits out of the prices for war supplies. Nothing would be more deadly for the nation, for its ability to conduct the war, or, for that matter, for business itself. Happily, and, as expected, I find most business men dealing with the government take that attitude. The pressing need is that this attitude be made clearer and unanimous. If it is not, then the results are going to be most serious.



A. F. HUSTON
Member Committee on Steel and Steel Products

L. E. BLOCK
Member Committee on Steel and Steel Products

WILLIS L. KING
Member Committee on Steel and Steel Products

A. C. DINKEY
Member Committee on Steel and Steel Products

On July 11, an important meeting was held in Washington at the call of Newton D. Baker, secretary of war, and attended by the committee of the American Iron and Steel institute, as well as by Secretary Daniels, Mr. Baruch and other government representatives. It was this meeting which actually paved the way for the fixed price structure which later was determined upon by agreement between the industry and the government. Hitherto it had been thought that the fixing of prices for government purchases alone might answer the needs of the situation, but the manner in which prices were to be fixed, if at all, was a matter of speculation. It was not at all an accepted theory that they might be fixed legally, and the situation was in a complicated state due to a number of factors. Among these was the proposal to include iron and steel and their products in the provisions of the food control bill. At the meeting of July 11, it first was brought out that regulation of prices on government purchases alone might prove unfeasible, since in that case the economic fabric of the country would suffer from the runaway market figures which private buyers would have to pay, and there would be a constant temptation to steel producers to sell material at the outside market prices rather than at the special government figures. It was not then considered that the government needs would be so large as to necessitate the submerging of all nonessential private business. At the conclusion of the meeting, Secretary Baker announced that the American Iron and Steel institute committee had given assurances that the entire capacity of the iron and steel industry would be available to the government and that everything possible would be done to increase production. The prices to be paid, Mr. Baker said, had been left for determination after the federal trade commission had completed the investigation of production costs.

Even after this meeting the belief that prices ultimately would be fixed was scouted by a great many individuals who did not see how such action could be taken legally, nor how any attempt to fix prices could result in anything but utter failure because of its infraction of natural trade and economic laws. In July and August, 1917, numerous events occurred which had a bearing upon the question of fixed prices. Among the most important was the passage of the food control bill which provided for government regulation of production and prices of food and fuel. Simultaneously Senator Pomerene of Ohio introduced a bill providing for government regulation of the production and distribution of iron ore, iron, steel and their manufactures. On the same day, Aug. 8, the war industries board issued a statement announcing its intention to insist that the government and the allies pay identical prices for war materials. But in response to questions, Judge Robert S. Lovett, who issued the statement, refused to commit himself as to whether any new legislation would be necessary for the regulation of iron and steel prices. In insisting that the allies should enjoy the same prices as the government, he explained that this policy must be reciprocal and that the arrangement should be limited to war materials.

Among the radical proposals which contributed toward the shaping of events at that time was one by the federal trade commission for a law providing for the suspension of contracts under which steel, pig iron, ore, etc., were being supplied at prices higher than the level the commission thought should be fixed. Many congressmen and the federal trade commissioners held that such abrogation of contracts could be effected constitutionally, although a different view had been held by the fuel administration after the announce-

ment of fixed prices on fuel by the president. The federal trade commission's bill, if it had been passed, would have placed the entire iron and steel industry, from mine to finished product, under government control. The commission, in advocating its bill, favored the making of prices high enough to stimulate production but insisted that any fixed prices must be established by law as it feared that otherwise they might not be generally adhered to by the industry. The report of the federal trade commission, which was submitted to the president in the latter part of August, 1917, was based on a study of the cost of production in the years 1902, 1906, 1910, 1916 and 1917.

Altogether the summer of 1917 was one of the most difficult and trying periods through which the iron and steel industry ever passed. In addition to the danger in which the industry stood by reason of the many radical proposals which were made, all orders being placed by the government provided that prices were to be decided later. The tonnages then going to the government were increasing by leaps and bounds. J. Leonard Replogle, who left the presidency of the Wharton Steel Co. late in August to become advisor on steel to the war advisory board, and who later became director of steel supply of the war industries board, estimated on Sept. 17, that the war requirements of the United States government in iron and steel up to the end of 1917 would call for 5,000,000 to 6,000,000 tons. In view of the prevailing state of uncertainty, therefore, it was with great satisfaction that the leading iron and steel producers on Thursday, Sept. 20, received telegrams from the war industries board asking them to attend a conference to be held on the following day in the Munsey building at Washington for the purpose of determining prices on iron and steel.

President Announces Prices

The momentous conference extended over Friday and Saturday, Judge E. H. Gary, as spokesman for the iron and steel industry, voiced the desire of the entire industry to do all in its power to help the United States and its allies win the war and its willingness to make any sacrifice in achieving this result. This conference was conducted in business-like fashion, the various products being placed in the hands of committees for presentation to the representatives of the government. An agreement was arrived at as a result of this two-day session which formed the basis of the following announcement, Monday, Sept. 24, 1917, by President Wilson:

The president has approved an agreement between the war industries board and steel men fixing the following prices which became effective immediately and are subject to revision Jan. 1, 1918:

Mesabi, nonbessemer ore	$ 5.05
Foundry, pig iron, valley	33.00
Bessemer pig iron, valley	36.30
Basic pig iron, valley	33.00
Steel bars, Pittsburgh-Chicago	2.90c
Structural shapes, Pittsburgh-Chicago	3c
Tank plates, Pittsburgh-Chicago	3.25c

It was first stipulated that there should be no reduction in present rate wages; second that the prices named should be made to the public and to the allies, as well as to the government; and third that the steel men pledge themselves to exert every effort necessary to keep up the production to the maximum of the past, so long as the war lasts.

Measures will be taken by the war industries board for placing orders and supervising the output of the steel mills in such manner as to facilitate and expedite the requirements of the government and its allies for war purposes, and to supply the needs of the public according to their public importance and in the best interests of all.

A spirit of co-operation was manifested by the steel men and, no doubt, is entertained that every effort will be made to bring the production as nearly as possible up to the extraordinary demands resulting from the war.

Thus came into being an institution which previously had been regarded as impracticable and impossible, the structure of fixed prices on iron and steel. The peculiar and distinctive feature of these prices was that they were based entirely upon a voluntary pledge by the iron and steel men. The President's plea of one price for government, public and allies was accepted. Competition, which was the dominating principle of the Sherman law, and which had been the basic idea in numerous dissolution suits in prewar days, was wiped out at one stroke. Although the trade as a whole was inclined to regard the agreed maximum prices as lower than was advisable, the conclusions of the meeting were received with great satisfaction. While only a few base prices had been decided upon, they at least afforded a foundation for the settlement of payment for large tonnages of steel previously sold and delivered to the government.

J. A. TOPPING
Member Committee on Steel and Steel Products

H. G. DALTON
Chairman Subcommittee on Pig Iron, Iron Ore and Lake Transportation

E. G. GRACE
Member Committee on Steel and Steel Products

J. A. BURDEN
Member Committee on Steel and Steel Products

Particular satisfaction was felt over the agreement with the war industries board that the prices agreed to should not be retroactive with respect to contracts already on the books of the various makers.

Following the announcement of Sept. 24, work immediately was begun on the formulation of base prices for other products not covered in the original announcement, as well as the formulation of lists of extras and differentials. The president made a second announcement under date of Oct. 11, 1917, as follows:

The President has approved an agreement between the war industries and the steel men fixing the following maximum prices which become effective immediately and are subject to revision Jan. 1, 1918:

Billets and blooms, Pittsburgh and Youngstown	$47.50
Slabs, Pittsburgh and Youngstown	50.00
Sheet bars, Pittsburgh and Youngstown	51.00
Wire rods, Pittsburgh	57.00
Grooved skelp, Pittsburgh	2.90c
Sheared skelp, Pittsburgh	3.25c

The prices enumerated have been fixed by the President on the assurance of those representing the steel industry that these prices equitably adjust the relations of the steel interests to each other, and will assist them in fulfilling their obligations to give the country 100 per cent of production at not to exceed the prices heretofore announced.

Measures will be taken by the war industries board for placing orders and supervising the output of the steel mills in such manner as to facilitate and expedite the requirements for war purposes of the government and those nations associated with us, and to supply the needs of the public according to their public importance and in the best interests of all, as far as practicable.

A spirit of co-operation was manifested by the steel men and, no doubt, is entertained, that every effort will be made to bring the production as nearly as possible up to the extraordinary demands resulting from the war.

A third announcement covering the base prices on still other products was made by the President on Nov. 5, 1917, as follows:

The President has approved an agreement made by the war industries board with the principal steel industries of the United States, fixing maximum prices subject to revision Jan. 1, 1918, on certain steel articles as follows:

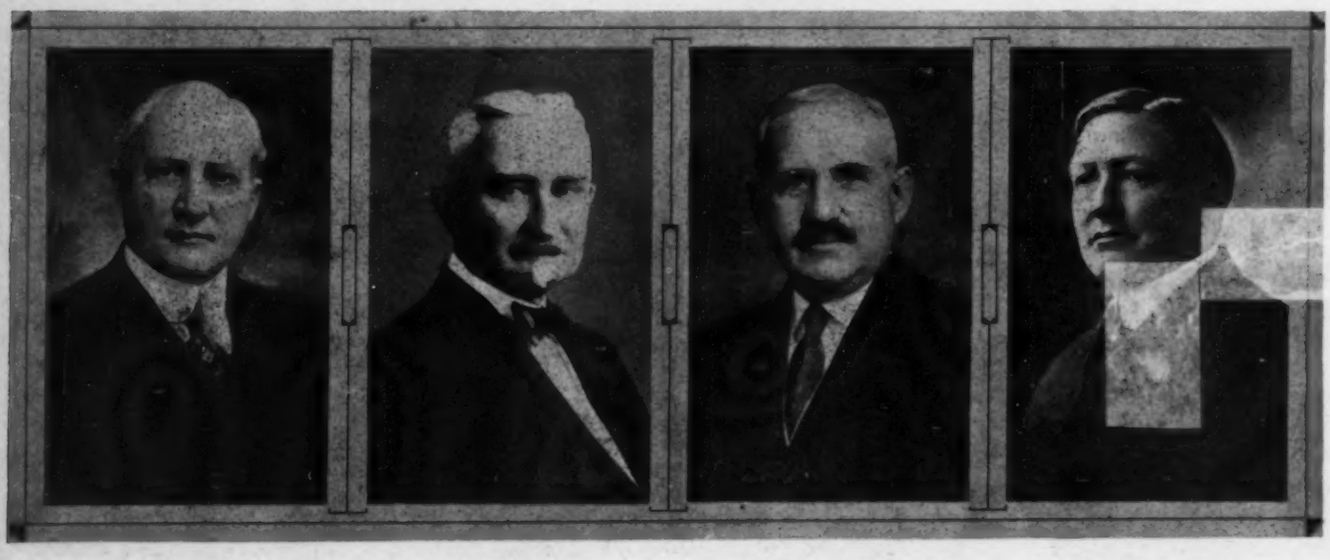
No. 28 black sheets, Pittsburgh	5.00c
No. 10 blue annealed sheets, Pittsburgh	4.25c
No. 28 galvanized sheets, Pittsburgh	6.25c
Tin plate, Pittsburgh	7.75c
Plain wire, Pittsburgh	3.25c
Cold rolled steel, Pittsburgh.	6.50c
No. 1 heavy melting steel, delivered	$30.00
Cast iron borings, delivered.	20.00
Machine shop turnings, delivered	20.00
No. 1 railroad wrought, delivered	35.00

In connection with the above, the iron and steel manufacturers have agreed promptly to adjust maximum prices of all iron and steel products other than those which prices have been agreed upon. It is expected that this will be done promptly and consistently in line with the basic, intermediate and finished products for which definite maximum prices have been established.

With the exception of the foregoing base prices, all other base prices, and differentials and extras, therefore, were left to the general committee of the institute for determination. They were the subjects of announcements which were made by this committee from time to time through Judge Gary. The only other announcements of fixed iron and steel prices which thereafter emanated from the government were those by President Wilson naming reaffirmations or changes in prices for the quarters beginning Jan. 1, April 1, July 1 and Oct. 1, 1918, respectively.

An innovation which was embodied in the original price agreement was the establishment of a dual basing system, by which prices on plates, shapes and bars were fixed both from Pittsburgh and Chicago. This provision resulted in considerable loss to steel companies when shipping from the east to the west or from the west to the east as the war industries board, when its attention was directed to this point, directed that when an eastern mill shipped to Chicago, for instance, the price should be based upon Chicago. The dual basing system was abandoned when prices were reaffirmed as of Jan. 1, 1918.

But the last was not heard of it until the middle of December. When it was decided to do away with Chicago as a basing point, the Emergency Fleet corporation agreed to the use of the single Pittsburgh basis in connection with all contracts placed after June 30. But it insisted on securing the benefits of the dual system on all purchases made before July 1 irrespective as to when shipments were made. It was not until Decem-



J. I. ANDREWS
Chairman Subcommittee on Tin Plate

JOHN HUGHES
Chairman Subcommittee on Pig Tin

JAMES A. BONNER
Vice Chairman Committee on Steel Distribution

ANDREW G. YOUNG
Chairman Subcommittee on Traffic Conditions

ber that the Emergency Fleet corporation reversed its attitude. It then announced that the single Pittsburgh base might apply to all shipments made after June 30 even though the orders had been placed prior to that date.

The hardships worked by the price agreement upon the various producers were of comparative extent. The Class 1 mills, which controlled all of their materials and equipment from the ore and coal to finished products, fared better than the Class 2 mills, which produced their own pig iron but purchased ore and coal in the market. Many of the Class 3 mills, however, who started their process in the open-hearth furnace, purchasing their pig iron from merchant blast furnace companies, had a real grievance. Some of the Class 3 mills producing plates and shapes, for instance, could not produce tank plates and plain shapes at a cost admitting of any profit at the fixed selling price. Had it not been for the differentials which these interests in most cases obtained for certain specialties which they produce, they would have lost money in selling at these prices. During the first six months that the maximum agreed prices were operative, these mills did not make serious objections, since during that time they still were delivering much tonnage booked at the high prices that prevailed prior to Sept. 24, 1917. Later, when their shipments were restricted almost entirely to business at the fixed prices, they undertook, through J. V. W. Reynders as their spokesman, to obtain relief. Because of the differentials they were able to obtain for specialties, their books did not show any loss on the total volume of their business and hence the price-fixing committee of the war industries board refused them special consideration. Rather than assume an attitude which might direct unfavorable criticism upon the iron and steel industry as a whole, the Class 3 mills dropped their claims. One particular development particularly was distasteful and costly to the Class 3 mills located in the east. This was the advance of $1 in the price of pig iron, in conjunction with the establishment of Pittsburgh as a basing point for eastern furnaces, and of Birmingham as a basing point for Alabama, Tennessee and Virginia furnaces, when prices were reaffirmed as of Oct. 1, 1918. Eastern mills always had obtained their basic pig iron from eastern furnaces, and their freight rates from these furnaces ranged from $1 to $1.10 per ton at that time. Thus, when they were forced to buy their pig iron on Pittsburgh base price, the freight differential and the advance of $1 per ton in the price combined to increase their pig iron costs by $3.75 to $4 per ton.

KARL G. ROEBLING
Chairman Subcommittee on Wire Rope

W. VERNON PHILLIPS
Chairman Subcommittee on Scrap Iron and Steel

W. S. HORNER
Chairman Subcommittee on Sheet Steel

L. R. LEMOINE
Chairman Subcommittee on Cast Iron Pipe

Infractions Are Negligible

Despite injustices which of necessity characterized the institution of so broad a structure as that of fixed maximum prices, and despite the fact that the great preponderance of demand over supply would have made it easy at any time for a mill to sell privately at almost any price it would have cared to ask, the infractions of the agreement between the industry and the government were so few as to be negligible. And the unprecedented efforts which were made to meet the government's war needs were apparent from the very beginning and were not relaxed until the armistice had been signed and the war declared to be at an end. As early as May, 1917, shipments of steel from the Pittsburgh district for use on government work had assumed such proportions that Rear Admiral Taylor, in commenting on the shipments for that month said,

"This figure is more than the six months' record shipments under normal conditions. It indicates that the steel manufacturers are living up to their agreement to meet the navy's requirements and are concentrating on government shipments. The mills are making a fine showing and appear to be in condition to do even better than this if it should become necessary in order to meet the demand for steel to be used in shipbuilding and other government construction."

Originally the general committee of the American Iron and Steel institute was organized at the request of the council of national defense to serve the latter in an iron and steel advisory capacity. Of this committee Judge E. H. Gary, chairman of the United States Steel Corp. and president of the institute, became chairman, and the membership was composed of James A. Farrell, president of the United States Steel Corp.; John A. Topping, chairman of the Republic Iron & Steel Co., and E. A. S. Clarke, president of the Lackawanna Steel Co. This committee, which held most of its meetings in

New York, established a sort of "clearing house" at Washington in charge of James B. Bonner, Philadelphia representative of the Carnegie Steel Co. Mr. Bonner acted as active agent of the committee and it was through him that all government iron and steel orders were placed in accordance with the recommendations made by the committee. Shortly after the appointment of the original general committee, Judge Gary appointed another committee to have charge of the distribution of steel orders from the allies. This was composed of Judge Gary, as chairman, James A. Farrell, E. A. S. Clarke and E. G. Grace, president of the Bethlehem Steel Co. Later this organization, which was included within the scope of the council of national defense, was considerably extended, and at the May, 1917, meeting of the American Iron and Steel institute Judge Gary announced that the general committee had appointed subcommittees as follows:

For ascertaining capacities and supervising allotments of orders to manufacturers—James A. Farrell, E. A. S. Clarke, J. A. Topping, E. H. Gary, ex-officio.

Alloys—J. A. Farrell, E. A. S. Clarke, A. A. Fowler, E. G. Grace, E. J. Lavino, E. H. Gary, ex-officio.

Iron ore, pig iron and transportation—H. G. Dalton, Frank B. Richards, Harry Coulby, C. B. T. Dyer, W. T. Shepard, G. H. Woodward, Leonard Peckitt, Frank Billings, Amasa S. Mather, secretary.

Sheet steel—W. S. Horner, Charles O. Hadley, Walter C. Carroll.

Scrap iron and steel—Eli Joseph, Samuel Deutsch, W. Vernon Phillips, Joseph Michaels.

Pig tin—John Hughes, E. R. Crawford, Edwin Groves.

Tinplate—J. I. Andrews, E. R. Crawford, E. T. Weir.

Tubular goods—James A. Campbell.

Legislative Obstacle Avoided

This organization did not long function as an auxiliary of the advisory committee of the council of national defense. The food bill which was passed on Aug. 8, contained a section which made it dangerous for any busines man to serve the government on committees such as those of the American Iron and Steel institute. Section 3 of the food bill provided that any person serving the government in an advisory or any other capacity, who advised, solicited or attempted to induce the placing of any contract with any company with which he was in any way affiliated, was punishable by fine of $10,000 and five years' imprisonment unless he set forth in every detail his connection with his company. Due to the provisions of the food control bill, therefore, members of advisory committees were in very real danger in the performance of their duties for the government. As the best way out of this situation, Judge Gary abrogated these committees in their capacity as components of the council of national defense organization. After discussion with his associate directors of the institute he reappointed the general committee and subcommittee as representative of the industry itself. Thereafter the general committee and subcommittee reported their recommendations to the war industries board. Control, from

F. N. BEEGLE
Chairman subcommittee on Cold Rolled and Cold Drawn Products

the industry's side, over the entire scheme of the industry's co-operation with the government was vested in the general committee.

To single out the various members of these committees from the standpoint of their individual efforts, would result practically in placing them all upon one plane. All cooperated to the extent of their ability and all gave gladly of their time and their knowledge, as well as of the services of their business associates and employes in carrying out the numerous requests that were made upon them. In most cases actual sacrifices resulted from consequent inattention to private business affairs. Gary, in his capacity as president of the institute, and chairman of the institute's general committee, proved himself one of the ablest leaders the industry has ever had. His broad vision, patriotism and capacity for submerging differences of opinion constituted the foundation for the creation and maintenance of the great organization which functioned so smoothly and efficiently in serving the government. Fortunately, however, high mentality and ideals and ardent patriotism characterize, as a class, the individuals who control the units of the iron and steel industry. That the eagerness of them all to contribute their utmost to win the war put them in a mood in which questions of self-interest were waived does not subtract from the record of high achievement of Judge Gary as their leader.

In the broad aspect of the institute's activities as a whole, the work of no single individual stands out more prominently than that of E. A. S. Clarke, president of the Lackawanna Steel Co. To Mr. Clarke fell the major portion of the task of formulating the lists of extras and differentials without which the fixed price structure, which saved billions of dollars to the government, the public and the allies, would have been incomplete and useless. Unattended by any outward glamor, this vital task occupied his entire time for weeks and months at a stretch, to the point of endangering his health, thus making his contribution one of the vital elements in welding together the great force of the iron and steel industry for the winning of the war.

Distributing Government Orders

Stimulation of production and alteration of capacity in accordance with the needs of the government, and the formulation of the price structure, comprised only the leading phases of the work of the American Iron and Steel institute in its service of the government. Among other branches of the institute activities was the aid it rendered in effecting the most desirable distribution of government orders. In all cases where large tonnages were to be placed for the government or the allies, or where individual consumers were unable to secure their supplies from their regular sources, these requirements were placed in the hands of the war industries board for allocation. The latter directed them to the attention of the institute subcommittee in charge of the particular product, and the subcommittee in turn made recommendations to the war industries board as to the producer or producers to whom the order should be given. Allocations made in this way involved millions of tons of iron and steel.

Among the final as well as one of the most important actions of the steel and steel products committee

was its decision in favor of a general moderate reduction Jan. 1, 1919, upon being invited to appear before the price-fixing committee of the war industries board on Dec. 11 to consider prices for the first quarter. To discuss this proposal a meeting was held at New York and was attended by representatives of practically 100 per cent of the steelmaking capacity and most of the pig iron capacity of the country. Owing to the high costs then existing those present agreed to a proposal for a reduction only because the war was over and it was felt essential that recognition be given to public expectation of the cessation of war prices. As pointed out by Judge Gary at this meeting, the situation was such that lower prices ultimately were inevitable and a general and moderate reduction would be preferable to a decline accompanied by indiscriminate and perhaps ruinous price cutting. Although the price-fixing committee at the meeting, Dec. 11, confined itself to expressing its appreciation of the splendid co-operation of the American Iron and Steel institute and the industry during the war, and did not take up the matter of prices after Dec. 31 on the ground that the war industries board would be disbanded at the end of the year, the committee on steel and steel products made public the price reductions which it had prepared for recommendation. Immediately thereafter several large producers began offering first half delivery at these reduced prices.

Prices Are Reduced

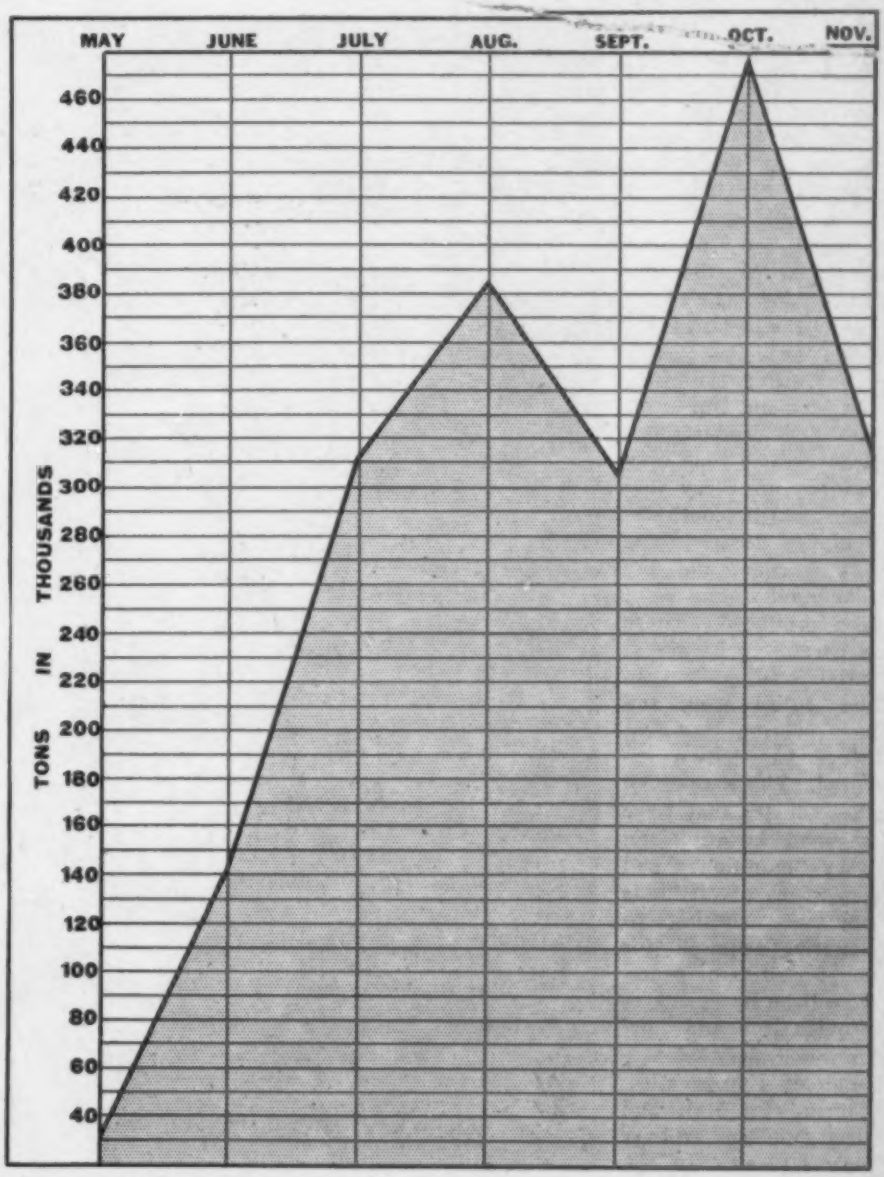
These prices represented reductions of from $3 to $6 and were applied to all leading products. The materials to which they applied were pig iron, semi-finished forms, structural shapes, merchant bars, sheets, cold rolled steel, wrought pipe, light rails, and tin plate. Wire products were not touched. These recommended reductions raised various questions incident to the transfer from a controlled back to a normal market condition. Probably the most important of these was whether concerns who had obligated themselves on material for delivery after Jan. 1 would be accorded the benefit of the lower prices against those commitments to which they would have been entitled had the lower schedules been ratified by the government.

With the work of winning the war at an end no further necessity existed for the continuance of the war service structure which had been erected by the iron and steel industry through the American Iron and Steel institute. The directors of the institute at a meeting Dec. 13 accordingly decided to disband the various committees. On this occasion Judge Gary said to THE IRON TRADE REVIEW:

Gary Dissolves Committees

"The committee on steel and steel products of the American Iron and Steel institute and its subcommittees were appointed for war service. Their work at first was in connection with different governmental departments, including more especially the secretary of war and the secretary of the navy, and later with different commissions named by the council of national defense and finally, after the war industries board was established, with that body. During the past year these committees have in many ways, and in connection with a good many different governmental departments, rendered efficient service in war matters.

"But, as the war has been won and the enemy decisively defeated, it is expected that the members of the war industries board will be relieved from duty and the board dissolved about Jan. 1, and therefore, as the necessity for war work on the part of the institute committees has passed, the committees have been abandoned to take effect Dec. 21. However, any unfinished work in the hands of the general committee or any of the subcommittees will be disposed of by the respective committees or some of their members under the general direction of the institute, even though the completion in any case might extend beyond the date last mentioned."



MONTHLY RECORD OF PIG IRON ALLOCATION DURING PERIOD OF THE COUNTRY'S GREATEST WAR ACTIVITY IN 1918

Great Coke Demand Will Continue

Fuel Administrator Garfield Forecasts Tremendous Need for American Steel in the World's Markets and of Maximum Output of Blast Furnaces

COKE is vitally necessary to the world and to you in time of peace as it has been during the war. The demand for coke is predicated upon the demand for iron and steel; when the demand for steel is great, the demand for coke keeps pace with it. During the war, the demand for iron and steel products has been greater than ever before and every furnace which could be equipped to run was put in blast and the maximum tonnage of iron produced. There is certain to be a material readjustment in the entire iron and steel industry now that peace has been secured. Those parts of the industry that were engaged in making war munitions and armament of all kinds now are turning to material required for the activities of peace. It will be necessary to provide iron and steel to the devastated sections of Europe. The demand for iron and steel products will be very great. In the first part of 1914, the exports of steel products from Germany amounted to 3,500,000 tons, and there is every reason to believe that the exports would have continued at this rate in the succeeding years had not the war disturbed commercial relations.

Those countries which were dependent upon England and Germany for steel products have been without a source of supply for more than four years and now are in great need of large tonnages. Therefore, it would seem that the demand for coke should continue to be very great with the world at peace.

For the last four years, the production of coke has steadily increased. In 1915 it was 41,581,150 tons; in 1916, 54,533,585 tons; in 1917, 55,600,000 tons; and in 1918, 56,900,000 tons. During hostilities, the nation did not experience any great coke shortage and the United States fuel administration was successful in filling the coke needs of the blast furnaces. Coke and anthracite pig iron production increased from 29,573,161 tons in 1915 to 39,019,123 tons in 1916. The production in 1917 was 38,164,976 tons and in 1918 approximately 38,000,000 tons. At present the production of coke is insufficient to satisfy demands. Those furnaces in blast do not have sufficient tonnage in their yards to protect them during the winter with its usual transportation difficulties. There is no reason to expect any material increase in production. In fact it is more logical to expect a falling-off in production, such as occurs every year at this time and continues through the winter. Unless there is a radical change in the iron situation, there will be a shortage of coke during the next few months and various furnaces will be forced temporarily to go out of blast. Now several new batteries of by-product ovens are in course of construction. Their production will be a material addition to the country's supply of coke. When these ovens are completed, the nation will be in a better position to supply all demands. Unless the demand for pig iron materially decreases and there is no reason to expect such a change, the demand for coke will continue with the world at peace, and it will be necessary to maintain a very close supervision over the movement of that product so that the largest possible tonnage of pig iron may be produced with the supply of coke that is available.

What of the Machinery of War?

With Building Capacity Expanded Many Fold and Shops Crammed With Equipment for Production of Munitions, Machine Tool Builders Face Difficult Problems of Readjustment—The Position of Used Machinery

BY B. K. PRICE

WITH the war at an end, the machine tool industry now finds itself, in common with other industries, confronted with many problems. During the busy days of the past few years little time has been allowed for consideration of these. In fact, due to the tremendous responsibilities which have fallen upon the machine tool builders in the prosecution of modern warfare, their problems in transforming back to a peace basis are so intricate and vast in their numerous ramifications, that they demand a high degree of attention required in few other branches of industry.

Among the foremost of these various problems is the disposition of war machinery. To answer fully this question at this time would be impossible. Yet, an analysis of conditions as they now exist and a brief survey of past developments will go far toward the formation of conclusions, based on other than mere assumption. The importance of this question, due to its bearing on the future of the machine tool market, readily is appreciated. During the past four and a half years, production in this country in order to meet the heavy demands of war has been increased beyond all expectations; in fact, it has been estimated authoritatively that the output of the past year alone has approximated the production of the 15 years preceding the outbreak of hostilities in Europe. With the war now concluded, the future of this vast amount of equipment thus employed forms an economic problem of considerable moment.

Eyes on the Future

PEACE brings to the American machine tool industry problems far greater than any with which it had to cope in wartime, gigantic as these were. Under pressure of huge war demands production facilities were expanded greatly. How these now are to be absorbed as well as what is to be done with the great number of machines built especially for war purposes and put to service are some of the big questions which must be answered. In the accompanying article these various factors and the conditions which underlie them are set forth and analyzed fully. What the cumulative effect of these conditions will be is to have a tremendous bearing on the prosperity of the American machine tool industry in the near future.

In an effort to discount some of the events of the future, it may be well to review a few of the outstanding developments of the past. When this country entered the war, the shellmaking industry was extensively developed. Early in 1915 the allies began to place huge shell contracts in the United States. Many of the old established companies of one description or another took on contracts of this character, and numerous new concerns sprang up to become engaged exclusively in the production of various kinds of projectiles. Subcontracts calling for the production of parts, were passed around throughout the metalworking industry. A vast amount of special equipment was required for this work, and the machie tool industry found itself rapidly diverting a large portion of its output to meet the new demand.

Contracts back in those early days of the war also were received, although naturally on a smaller scale, for other war supplies, such as rifles, field guns and heavy trucks. Subcontracts were distributed widely. Work of this character required a preponderance of the more standard type of tools, and so in the due

MANUFACTURING BROWNING MACHINE GUNS IN A NEW ENGLAND PLANT. PROFILING ON RECEIVERS

course of time equipment of virtually every description eagerly was being sought. This fact was reflected particularly by the fabulous prices paid in the second hand market. The machine tool builders were booked months ahead, and consequently, second hand tools brought heavy premiums, despite the fact that many of the tools purchased had been in service many years, or had been declared obsolete and out of date. New tools, at the same time, advanced rapidly, but were held within bounds by the deliveries at which they were available.

Notwithstanding these higher prices generally, however, the contractor, in taking on war work, did so in most instances at a figure which would enable him when the war was over to mark such equipment off his books. To the allies, unprepared as they were for such an emergency, speed in the production of munitions was a prime requisite. For it they were willing, if necessary, to pay heavily. It is estimated in some quarters that the cost of fully 90 per cent of the equipment purchased to produce shells and to fulfill other contracts requiring considerable special machinery, was discounted by the manufacturer in estimating his contracts. In other words, the manufacturer, to insure himself against loss, included not only a reasonable profit, but the cost of equipment. If the machinery eventually had to be scrapped, he would be in a position to do so without loss.

Another requisite, it may be stated, in the production of munitions was exactitude. It was due in no small measure to this fact, that the second-hand machinery trade generally took up the repair of used equipment. With the repair shops thus established it was able to be of inestimable service in the months which followed in keeping every machine tool possible in operation. Prior to the outbreak of the war in Europe, the second hand dealer's function consisted fundamentally of locating equipment, perhaps improving its appearance with a coat of paint, and then finding a buyer. Little effort was made to better the operating condition of the machine. When the avalanche of buying set in following the heavy allotment of munitions in this country by the entente powers, these tools were sold at undreamed of prices, owing to their availability for immediate shipment. However, the need of good tools early became apparent, and furthermore, at the same time, new tools became increasingly scarce. The result was that second hand dealers established repair plants throughout the country.

CHAMBERING RIFLE BARRELS IN A LARGE EASTERN RIFLE MANUFACTURING ESTABLISHMENT. AFTER THE SIGNING OF THE ARMISTICE BY GERMANY, A LARGE NUMBER OF THESE CHAMBERING MACHINES WERE PLACED UPON THE MARKET

It was in the shellmaking industry that the great bulk of special equipment required for war work was employed. Standard tools in a general sense were used only in the tool rooms, and therefore constituted a comparatively small portion of the equipment in operation. As a result, the majority of machine tools engaged in manufacturing shells is not readily adapted for peacetime production. Changes might be, and probably will be effected in some instances, but it is believed that such alterations will prove costly, even though the equipment should be in fairly good condition to receive them.

Furthermore, the machines as a general proposition, have had exceedingly hard usage. They were operated day and night, in many instances by careless and untrained workmen, and, consequently, did not receive the usual care and attention. It was not an uncommon occurrence back in the early days of the war to see a whole unit discarded and replaced by new machines. As the war progressed and equipment of all descriptions became increasingly scarce, munitionmakers were forced to change their tactics. An effort then was made to make repairs, when possible, and thus many machines were kept in service. It is obvious, therefore, that much of this equipment at the present time is practically worn out, is out of alignment and generally is unfit for first class work. Hence, the shellmaking equipment, all things considered, likely will not be a large factor in the future of the machine tool market.

A Different Phase is Introduced

In the case of rifles, field artillery, airplane motors, ships and certain other war supplies, however, the situation is somewhat different. For the bulk of this work, the more standard types of machine tools were required, and the disposition of this equipment, therefore, forms a more interesting problem in its bearing on future trading. Much of it is owned by the government. When the United States entered the conflict, production along the various lines of war necessity required considerable expansion. This was accomplished by governmental assistance, the government buying many of the necessary machines and retaining title to them. Work on the production of rifles and field guns was being done for the allies long before the United States entered the conflict, and the machinery in a number of plants thus engaged largely was owned abroad. It was assumed at that time that the machinery, such as was fit, eventually would be shipped to the other side; in order to accelerate the production of ordnance for its own use, however, the government purchased this equipment also.

Now that the war has ended and quantity production along these lines for the most part no longer is necessary, a large number of tools will be relieved. One exception perhaps is the government's shipbuilding program, which is expected to be continued on a large scale for many months to come. Hence, the equipment thus engaged will continue to be employed for at least a corresponding length

of time, making due allowances for replacements. With equipment operating in other lines, it is probable that at least a fair portion will not have to be reckoned with in future trading These machines, such as shellmaking tools, have served their purpose and will be scrapped, after withstanding the many rigors of wartime production.

Government to Sell Machines

In all probability the government will sell the remainder in the market. It is understood that the various companies have the option of buying this equipment, if they so desire. It is believed this will be done extensively by a number of the companies, especially the automobile manufacturers These have been engaged in the production of airplane motors and heavy trucks, and expect to revert to their regular peacetime production. In many cases this will be on a larger scale than ever before. It appears likely, however, that despite the various conditions and possibilities outlined, the government will remain in possession of a large number of standard tools.

It has been suggested in some districts that the government, in line with action taken on previous occasions, will proceed to scrap all of the machinery. Others believe that it will be stored in warehouses, such of it, of course, as is in fairly good condition, to be held for another national emergency. Again, the opinion has been expressed that the equipment will be auctioned off to the highest bidder as early as possible, or that it may be stored in warehouses and liquidated gradually. It would seem that of these, the latter procedure would be the most favorable.

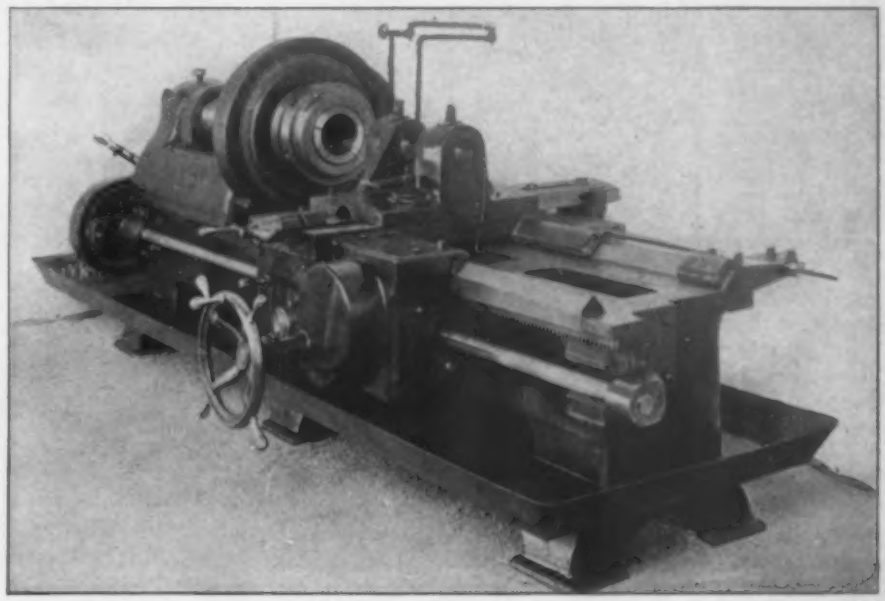
In many instances, the government did not buy the necessary new equipment. Where this was the case, the purchases generally were made by the manufacturer with a view to utilizing the machinery later upon the advent of peace. While some of this equipment probably will need to be replaced, much of it no doubt is in good condition. To appreciate this fact, the huge orders being completed up to the day hostilities ceased have but to be recalled. A large amount of this equipment has seen little if any service.

Many Tools to be Reclaimed

Despite the fact that a considerable amount of equipment will be retained, from present indications it would seem likely that during the period of readjustment, many standard machines will be offered. These offerings of single tools or small lots will aggregate a fairly large volume. Should the government decide to dispose of its equipment, unquestionably a large number of standard tools will be placed upon the market. In that event, with the excellent repairing facilities which now prevail, it would seem that many of them can be reclaimed for active service for many years to come.

One question is being considered seriously by some of the second hand machinery dealers. This is whether they will be able to obtain sufficient supply parts. When the war was in progress, no difficulty was experienced in this respect except where the manufacturer was temporarily short of the parts desired. Toolbuilders were booked months ahead on their finished product, and all equipment possible was needed in the prosecution of the war. However, the situation has not been changed radically. The question of national duty is no longer involved, and it is believed in some quarters that the machine toolbuilders will be less inclined to furnish these supplies, now that accepted business considerations are to displace those of patriotism. Such a plan, however, machine toolbuilders claim would manifest a rather narrow policy, and it appears probable that unless competition with the second hand market becomes extraordinarily keen, little difficulty will be encountered by dealers in this respect.

It is a foregone conclusion that much special equipment will be offered for resale. This equipment, as indicated, will be coming out for the most part from private companies, since the shellmaking industry was well established when this country entered the war, and little governmental assistance was needed. Had the war continued and the country's shell program been carried out on the greatly increased scale contemplated at the time the armistice was signed, such aid eventually might have been necessary. That comparatively little of the single purpose machinery offered will find a ready market is likely. In fact, until conditions become settled more definitely, second hand dealers probably will move slowly in taking on equipment of any description. As a result, many owners will be forced to retain their machinery. Others probably will do so voluntarily, hoping that it may bring better prices later. It would seem probable that in some cases equipment will be left standing in abandoned munition plants, perhaps for years.



A 25-INCH BORING MACHINE, ESPECIALLY ADAPTED FOR THE MANUFACTURE OF 6 AND 8-INCH SHELLS. WITH ITS LARGE JOURNALS AND HIGH RATIO OF GEARING, IT IS HIGHLY SPECIALIZED FOR THE PURPOSE INTENDED

Indicative of late developments in the munitions industry, the following incident is cited. A shellmaker shortly before the signing of the armistice placed an order for a single purpose machine at the manufacturer's price of $1600. Upon the cessation of hostilities, he asked to be relieved from his contract. This request was granted by the machine tool builder, for regardless of whatever other considerations were involved, the various aspects of the situation for him, too, had changed. The price quoted on the machine in question was based on the production of 150 of such machines. Perhaps orders were not on hand at the time for the entire lot, yet with the continuation of war the machines could be easily disposed of. However, such prospects had been

dissipated. In the meantime, the shellmaker, in an effort to keep his plant in operation, had been successful in obtaining a contract for producing cylinders for a certain patented device. He sought to replace his order with the machine tool builder at the original price of $1600. This was refused. The manufacturer replied he would not consider the offer even if 50 per cent were added. In an effort to be of some assistance to the shellmaker, this manufacturer offered to shop among the shellmakers who had bought his equipment and without difficulty succeeded in obtaining a machine of the same type, in use only a relatively short time, for $500.

Now this case in a measure is typical. It sets forth the rapid decline in price values on special equipment. It also indicates that while manufacturers, in the broad sense, are doing all they can to ward off cancellations, some instances exist where cancellations are welcome. Manufacturers generally are operating their plants on the unit basis, and in a number of cases are working on contracts at a loss in an effort to fulfill contracts on lots of special machines. It is true, however, that the shellmaker who is fortunate enough to be able to engage his finishing equipment in peace work is in the minority. Consequently, such exactments as would be made by this class of manufacturers in the matter of a fulfillment of various orders placed, will not likely involve a large number of tools. It may be well to point out at this juncture that considerable forging equipment required in munition making will be utilized in the future, a number of manufacturers having laid plans in this direction.

Used Equipment Little Feared

As to used equipment, some manufacturers are inclined to regard lightly the possibility of any great competition in the matter of second hand tools. They believe that while these tools may be absorbed by some of the smaller and less important plants, they will not be a big factor in future trading. Others, however, are regarding the possibility more seriously. In many instances, they believe, they will be forced to compete with their own machines. Consequently, a number of builders are giving careful study to the character of peacetime demand, with a view to diverting their output, if necessary, to a line of equipment entirely foreign to their shops. Practically all manufacturers, however, are prepared not to be surprised in the event keen competition does develop, and this, of course, will be dependent largely upon the extent of future demand.

A factor which is expected to go a long way toward ameliorating conditions is the export demand. Virtually all European countries are engaged in reconstruction, particularly those which have been devastated by the war. These are expected to draw heavily upon the United States for supplies, perhaps for the next two to five years. The majority of these countries., it is believed, are not in the position to meet but a small part of the enormous demand for machine tools which now is apparent. In order fully to rehabilitate themselves economically, they must operate their plants full blast, and to do this they must have machine tools, and have them as quickly as possible.

Belgium Uses Many Tools

Belgium perhaps affords the most striking example of what is necessary to be done in the way of reconstruction. Belgium prior to the war was highly developed industrially. Her machine tool industry was especially well exploited. In proportion to the population probably more machine tools were in Belgium than in any other country of the world. Most of these tools, however, since have been removed, and the remainder, it is reasonable to suppose, have been made practically valueless by the hard usage of the past four and one-half years. Consequently it would seem that practically the entire machine tool equipment of Belgium will have to be replaced. For many months heavy orders for Belgium have been kept standing in this country, pending final declaration of peace. What is true of Belgium is true, in perhaps no less degree, of northern France, which, too, was far advanced industrially.

As indicated, countries not actually devastated during the war likewise will make heavy demands upon the American machine tool industry. The equipment in England, France and Italy naturally has been subjected to strenuous wear in the past four and one-half years, and while these countries have been continually importing foreign-made equipment, it is not probable that much of it will serve in peaceful pursuits. In fact, the bulk of the machinery bought by the allies was for munitions and undoubtedly will be subject to extensive replacing and scrapping, analogous somewhat to the situation in this country.

A high degree of efficiency will be required in the reconstruction period, in order that the nations as soon as possible again may return to normal conditions. This will necessitate the operation of the best machine tools and equipment of all kinds. A demand for new machine tools that cannot be filled immediately by these nations themselves will be introduced. This demand will have to be met by the United States. Because of this country's relatively short period of participation in the war, its natural resources and the size of the population, it has been able to retain more normal industrial conditions. Without doubt the financial assistance given the allied countries by the United States will be a factor in the placing of business in this country.

It is true that the machine tool industry in these countries has expanded, and will be in a position, provided raw materials are available, to aid in the reconstruction. At the same time, however, they, particularly England and Italy, never have been especially strong from a machine tool standpoint, and this fact recently was emphasized with regard to Great Britain by an English authority. He stated that from 70 to 80 per cent of the machinery necessary for making an engine for a British airplane is of foreign origin. With the manufacture of airplane engines, he included rifles, machine guns, motor cars, commercial vehicles, magnetos, scientific instruments, sewing machines, typewriters, etc. Russia at present appears to be an uncertain factor in the demand of the near future.

In addition to the rehabilitation of Europe, the pent-up requirements of the more neutral countries in all probability will result in heavy demands being made upon American machine toolbuilders. In South America and the Orient, evidence already is at hand of the large volume of inquiry likely to arise. China at present is regarded as a particularly fertile field for the sale of American equipment. The curtailment of European importations owing to the war has thrown China more upon her own resources with the result that an industrial movement has been begun in that country of no mean importance.

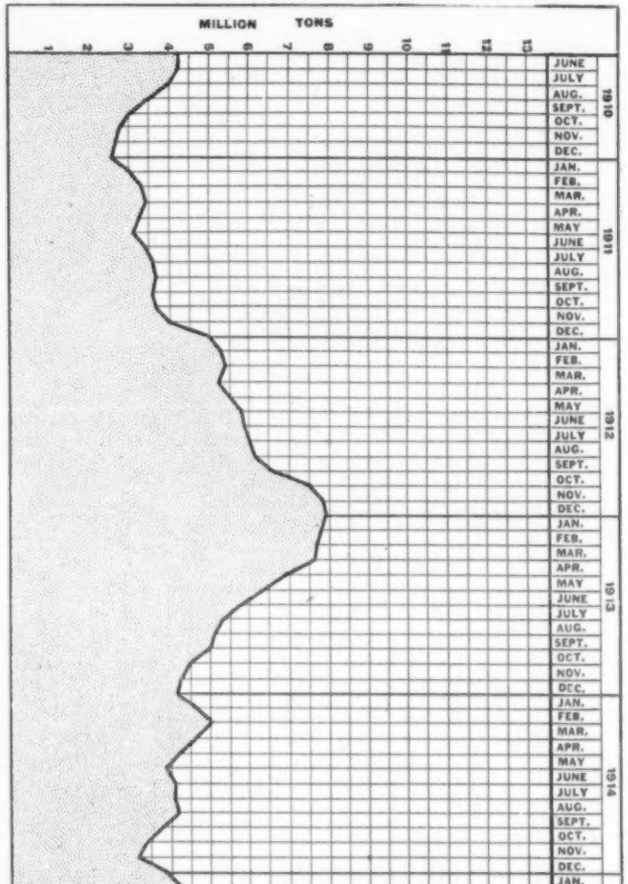
Germany Still a Factor

While the United States probably will assume the position Germany formerly occupied in supplying machine tools to France, to Italy and to many of the other countries throughout the world, Germany as a factor in the world's future trading in machine tools is not to be regarded too lightly. For practically the entire four and one-half years of war, Germany has been cut off from all importations from America and forced to maintain

THE IRON TRADE REVIEW

Charts showing monthly structural awards, production of pig iron, unfilled tonnage United States Steel Corporation, net earnings United States Steel Corporation and shipments of Lake Superior iron ore

Supplement to the issue of Jan. 2, 1919 THE IRON TRADE REVIEW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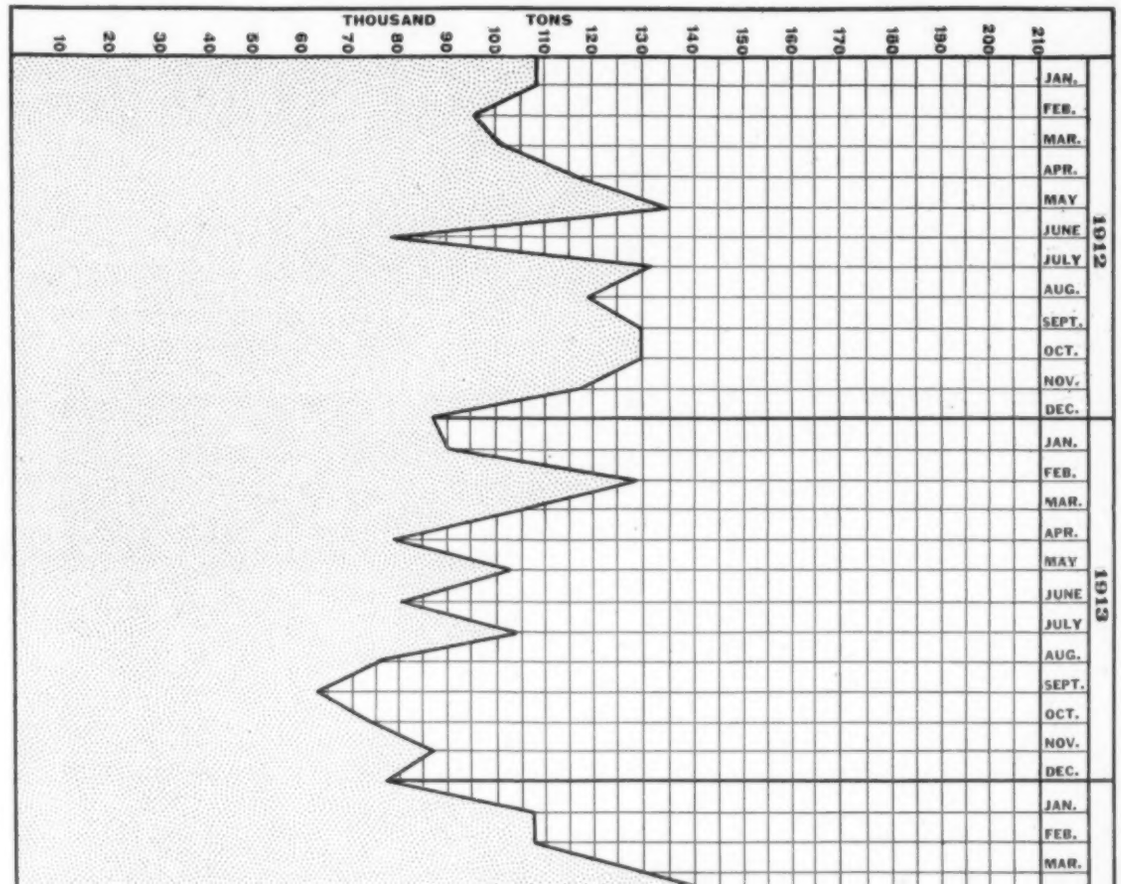
MONTHLY UNFILLED TONNAGE UNITED STATES STEEL CORPORATION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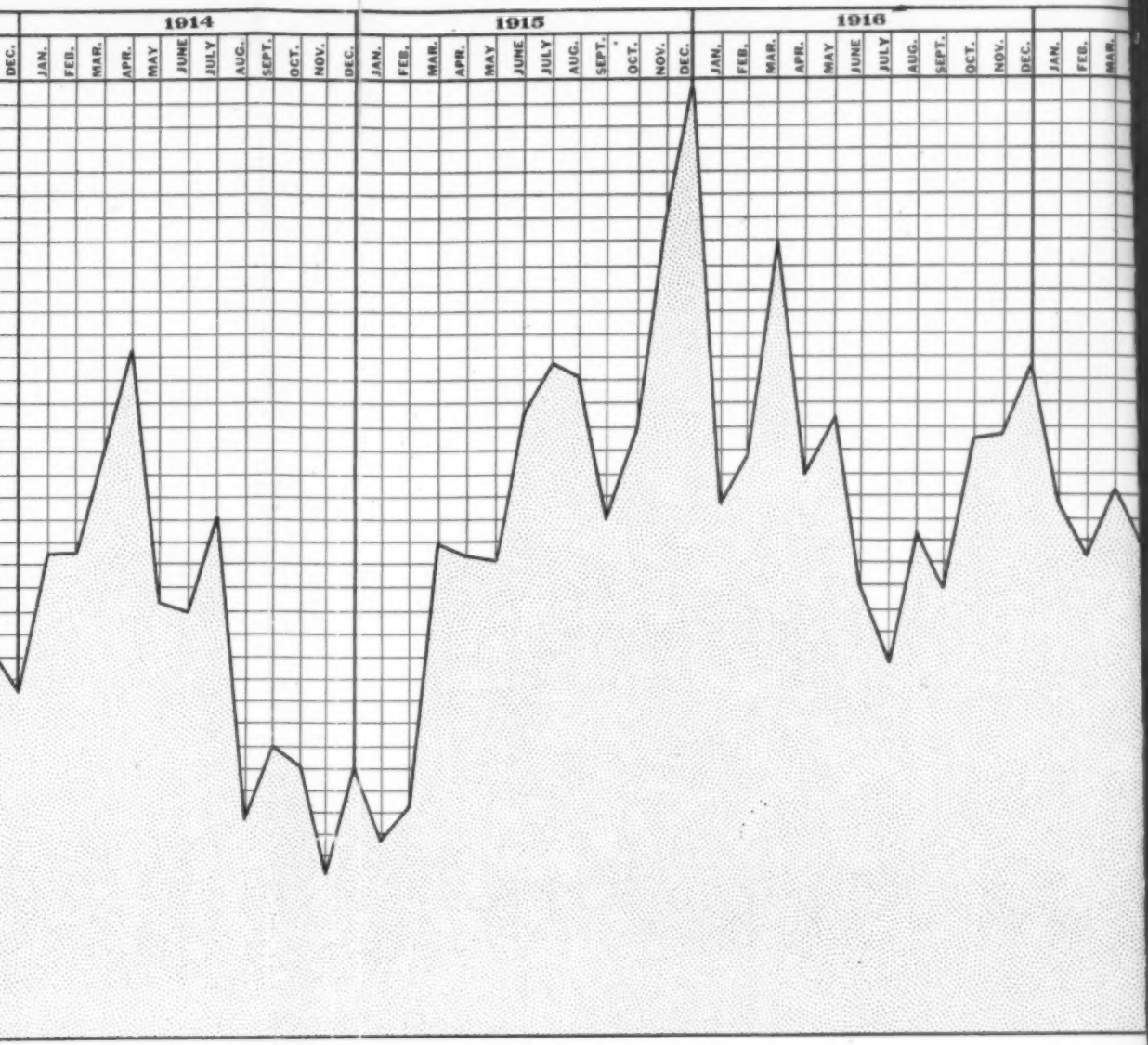
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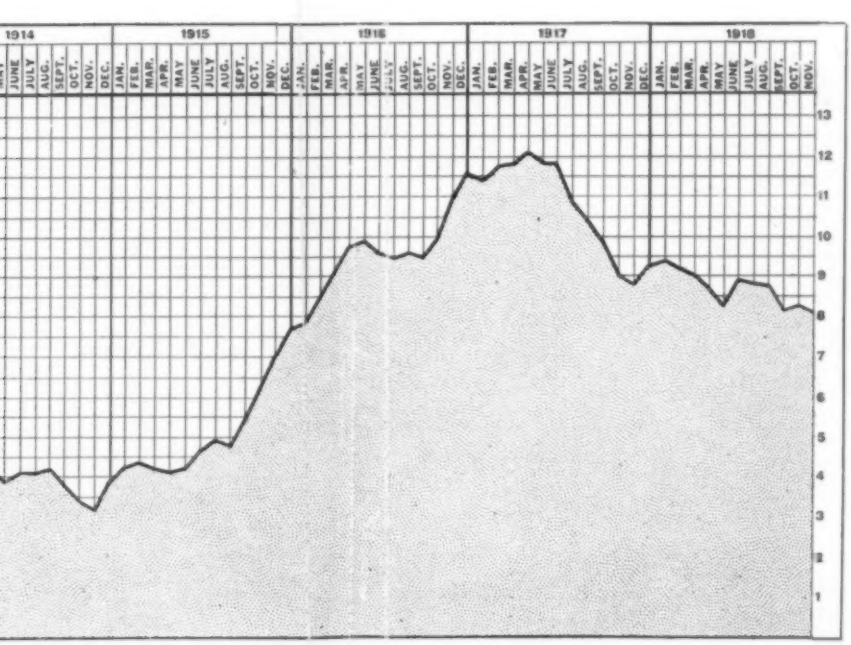
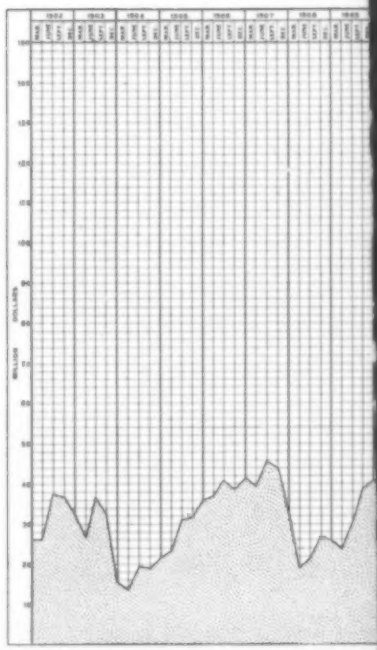
FABRICATED STEEL AWARDS BY MONTHS 1912-1918



UNITED STATES STEEL CORP. 1910-1918



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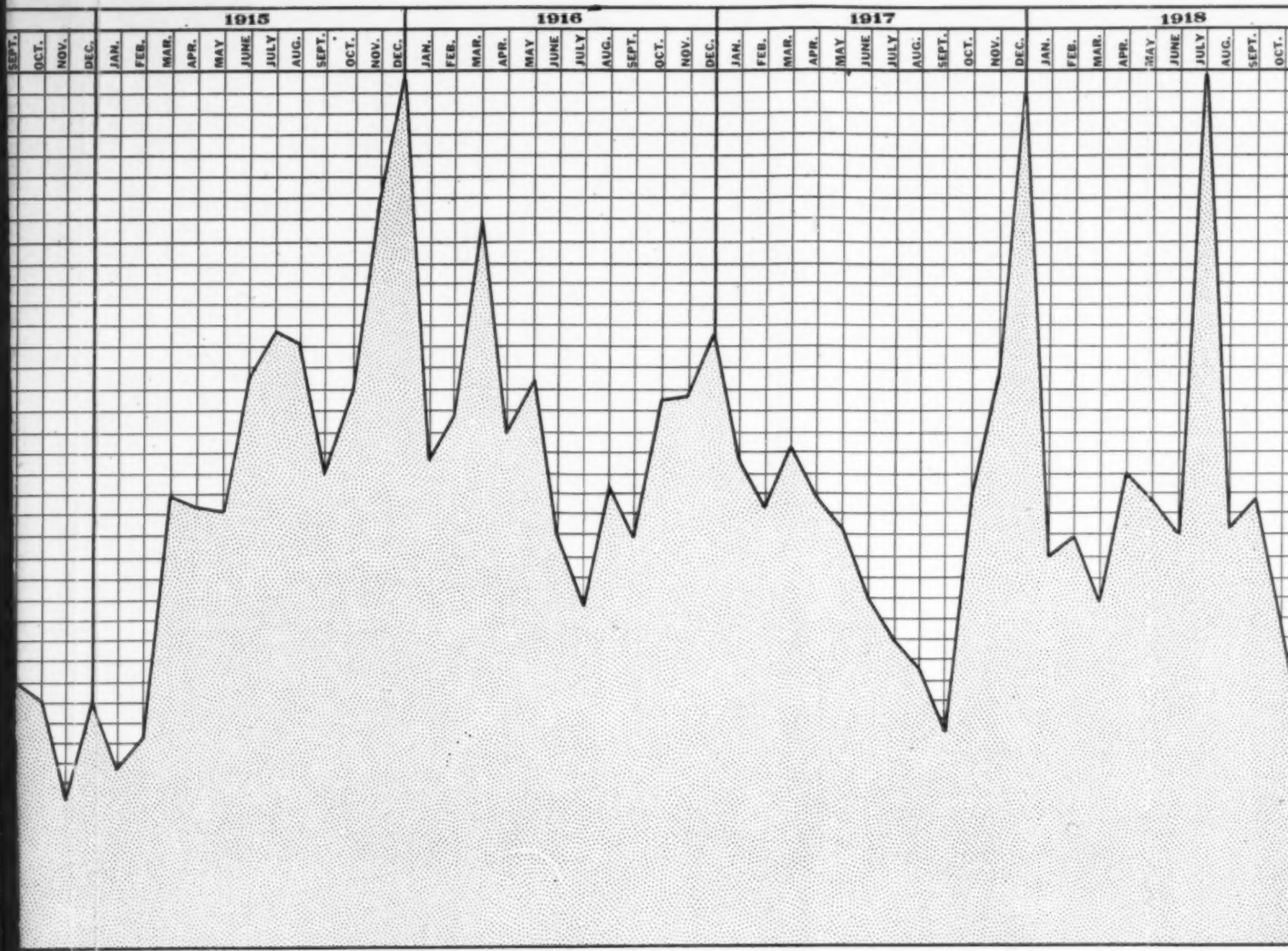
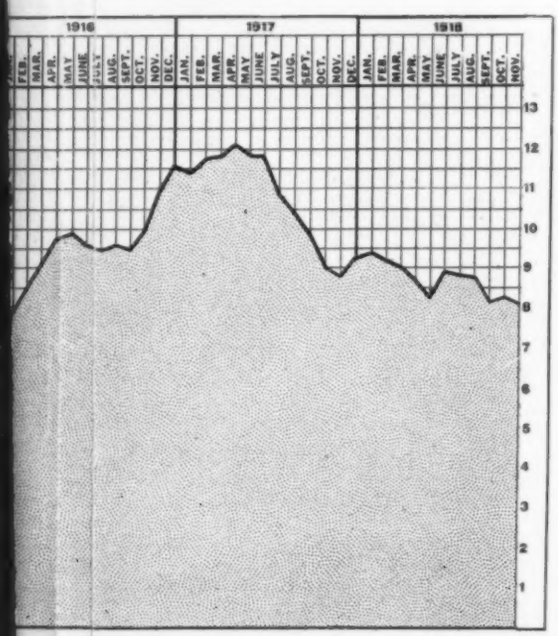


FABRICATED STEEL AWARDS BY MONTHS 1912-1918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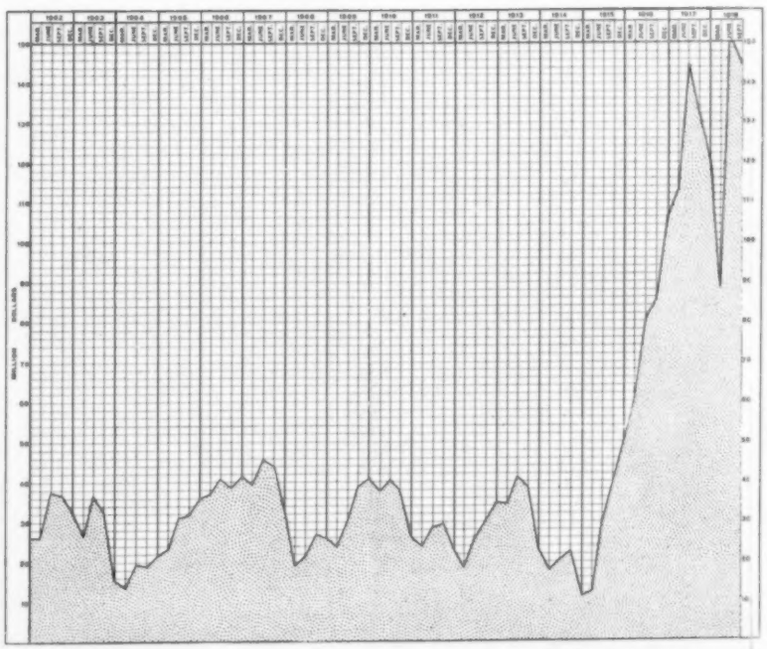
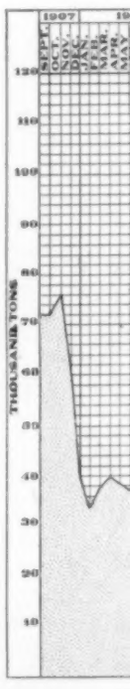
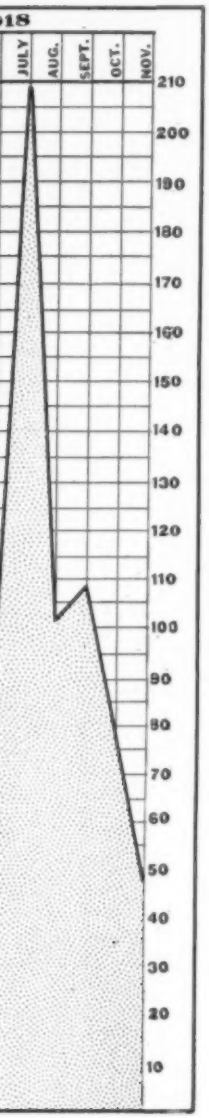
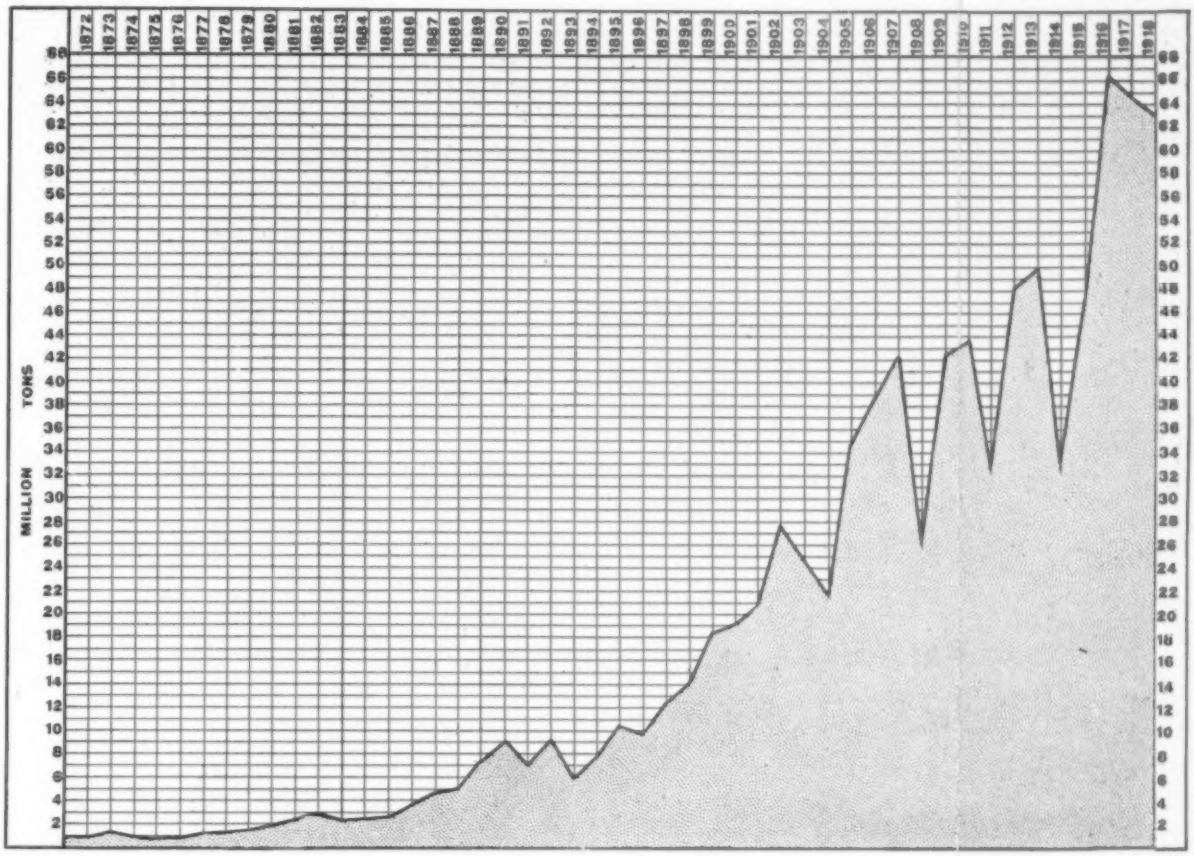


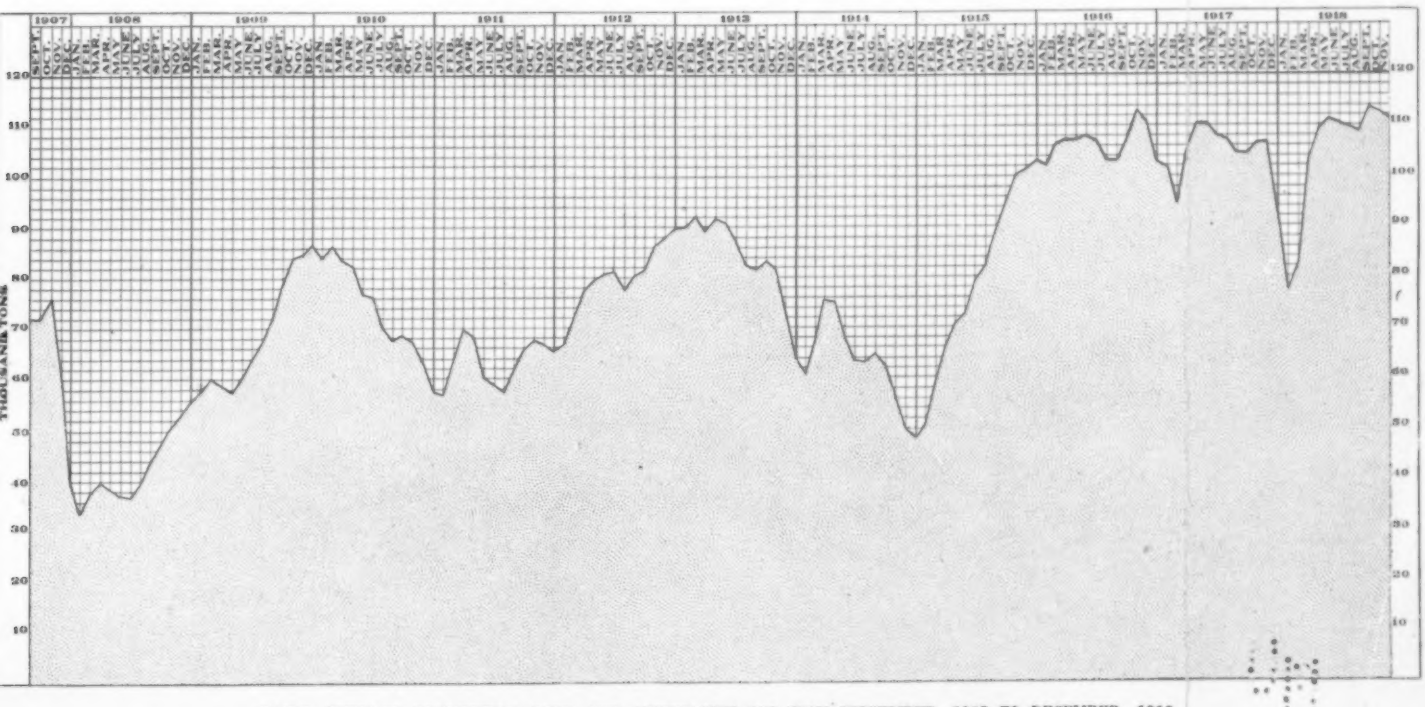
NET EARNINGS BY QUARTERS UNITED STATES STEEL CORP. 1902-1918







SEASON'S SHIPMENTS LAKE SUPERIOR IRON ORE 1872-1918



DAILY AVERAGE PRODUCTION COKE AND ANTHRACITE PIG IRON SEPTEMBER, 1907 TO DECEMBER, 1918

her normally tremendous output of machine tools in order to enhance the production of war munitions, despite the equipment taken from Belgium and northern France. As a result Germany probably will have an important group of machine toolmakers in the field as soon as conditions in that country become more settled.

In the domestic market, the railroad industry appears to be the most promising field for machine tool business during the next year or so. While in the past five months the purchases of the transportation lines have run fairly heavy, considerable equipment yet remains to be purchased. According to a recent statement given out at Washington, expenditures will be authorized for additions and betterments to ways and structures in 1919 amounting to $250,000,000, exclusive of rolling stock. This points to large machine tool requirements. Furthermore it was indicated that up to Dec. 1, 1918, almost $300,000,000 had been authorized for additions and betterments, exclusive of equipment, but at that time had not been expended. Flourishing conditions also are expected to prevail in the automobile industry for many years to come. Many manufacturers already have taken steps to bring their production up to what it was before the war. In some instances arrangements are being made for a still higher output. As a matter of fact, steps in this direction were taken many months ago, for in a majority of cases, particularly where the companies took up war work after the entry of this country into the war, only such changes were made as would in some manner serve later when peace would be restored. This additional equipment will in all probability be rounded out, and in some cases further units will have to be added in order that equipment already installed can be properly utilized.

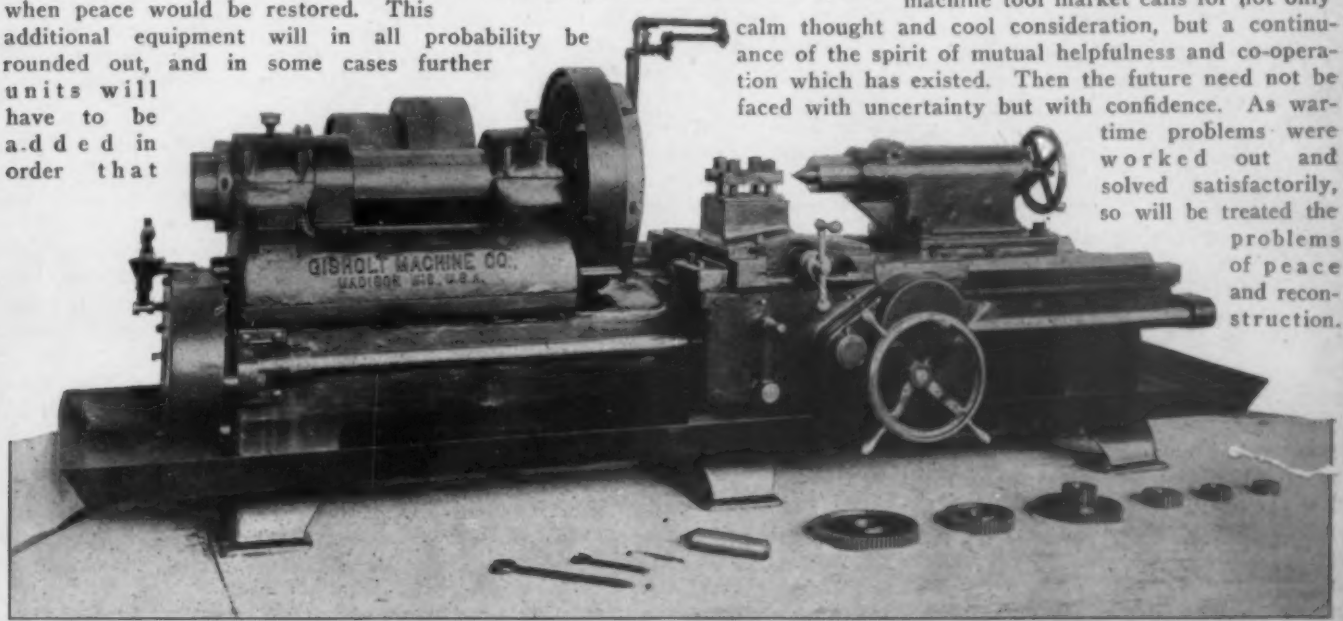
It is hardly to be expected, however, that much domestic buying of any description will set in for some time. Buyers in all probability will wait to see what develops as to prices and what the situation will be in connection with raw materials and labor. Furthermore, the companies formerly engaged in war work will have various adjustments to make in their own plants, and will necessarily have to revamp their plans to meet new conditions. So until such a time arrives when industry as a whole gains its equilibrium, the present inactivity may be expected to continue in a varying degree. Such a lull doubtless will be welcome in many respects to the machine tool manufacturer, since he, likewise, is confronted with similar problems.

Second Hand Market Bigger Factor

While the demand of the future will not compare with the heavy demand occasioned by the war, it appears likely it will not go below the normal level of prewar days for the reasons outlined. In many respects the return of a more normal demand undoubtedly will be desired by machine tool builders generally. Then, not only will wages and the supply of labor become stabilized, but prices will become adjusted and thus result in the more efficient and economical conduct of business. It does seem likely though that the second hand market in view of its rapid development of the past few years, particularly in the matter of reclaiming tools, will be a far greater factor in the machine tool distribution of the future, than it was prior to the outbreak of war in 1914. Industry has been educated to the value of reclaimed equipment and should there be a number of the more standard types of used tools thrown upon the market at the very low prices recently paid they can be rebuilt at a cost which may make them formidable competitors with new tools in several lines of manufacture.

For many months, tool builders did not have to think of an outlet for the disposal of their output. They were able to concentrate on the productive end. Their entire energy was expended in supplying the demands of war plants for more machines. All this now is changed. Large demands there will be. New avenues will be opened up; must be opened up if the country's increased productive capacity is to be utilized. Another factor now enters. Namely the government's request that the machine tool builders arrange to dispose of government-owned equipment when selling new machines.

As clarifying the situation as regards the government-owned machinery in war plants, an announcement was made on Dec. 18 by Assistant Secretary of War Crowell. In it he stated the government now owns $300,000,000 worth of machine tools. Instead of dumping these on the market for what they will bring, the government will ask the toolbuilders to dispose of them at the rate of 20 per cent of the current sales. He stated further that the government probably will not preserve any of the machinery bought during the war unless it is found that a portion is not likely to be changed in design. Altogether, the present and future machine tool market calls for not only calm thought and cool consideration, but a continuance of the spirit of mutual helpfulness and co-operation which has existed. Then the future need not be faced with uncertainty but with confidence. As wartime problems were worked out and solved satisfactorily, so will be treated the problems of peace and reconstruction.



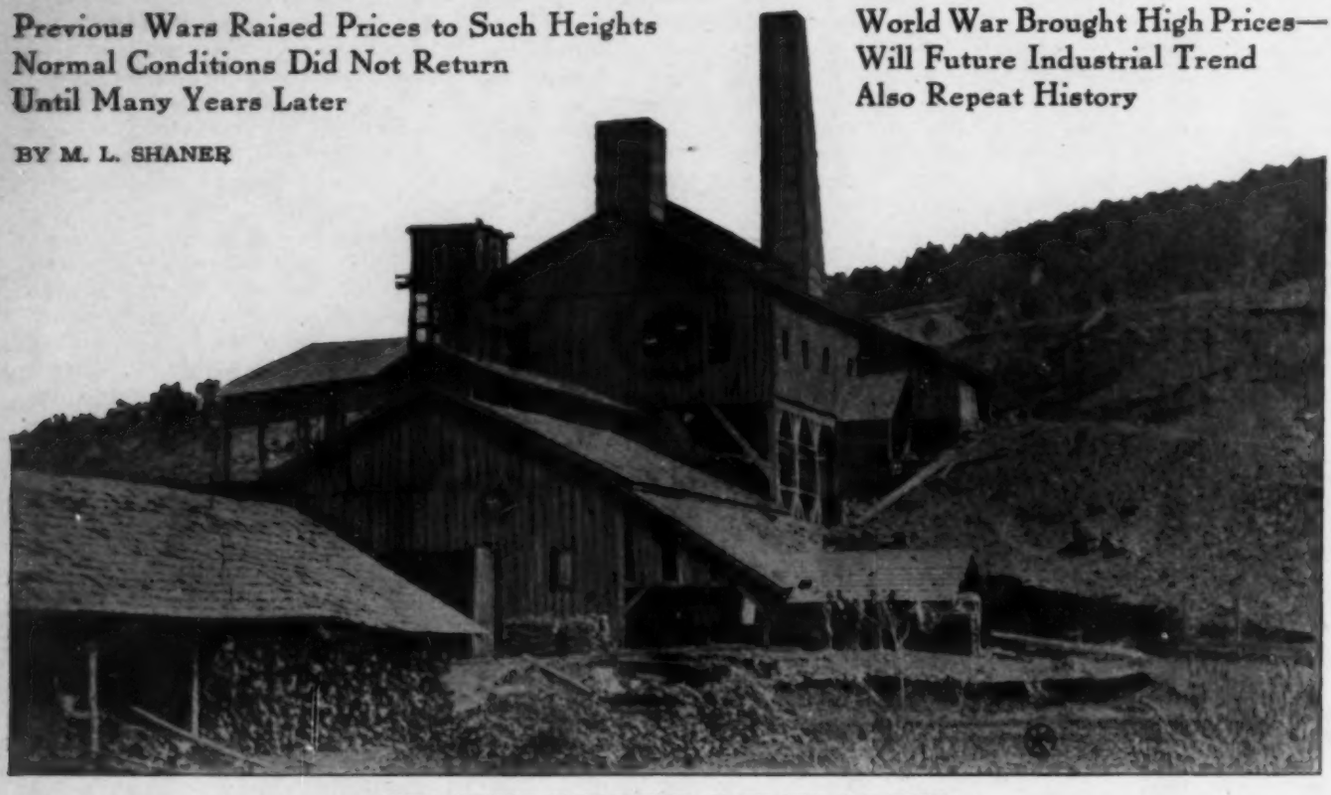
HIGHLY SPECIALIZED MACHINE FOR TURNING 6 AND 8-INCH SHELLS. THE JOURNALS ARE MORE THAN FOUR TIMES LARGER THAN THOSE USUALLY REQUIRED FOR A MACHINE OF THIS SIZE

The God of War Retires—What Now?

Previous Wars Raised Prices to Such Heights Normal Conditions Did Not Return Until Many Years Later

World War Brought High Prices—Will Future Industrial Trend Also Repeat History

BY M. L. SHANER



EARLY AMERICAN BLAST FURNACE OF THE CIVIL WAR PERIOD

"I am the God Thor!
I am the War God!
I am the Thunderer!
Here in my Northland,
My fastness and fortress,
Reign I forever.
Here amid icebergs,
Rule I the Nations.
This is my Hammer;
Whenever I hurl it
Strength is redoubled."

FROM August, 1914, to November, 1918, for four years and four months, Thor's hammer was wielded with unremitting fury. If the poem speaks truth we are justified in concluding that at the end of this, the greatest war in history, the victorious war-making nations of the world have increased their strength manyfold. Any one who has followed the wonderful industrial expansion brought about in this country by the war realizes that there is truth in the poem in this instance at least. The question is, will this industrial growth prove permanent or is it but a transitory phase which will vanish now that the war which called it forth is over. For that we have no sure answer, but if we turn back the pages of history to our previous wars we may be able, judging by antecedent probability to determine whether the industrial world does, on the whole, derive permanent benefit from the war.

Our first war, which made us an independent nation, made the manufacture and refinement of iron possible in this country, for previous to the Revolution, Great Britain had by every means in her power endeavored to stamp out ironmaking in the colonies. Through the seventeenth century and in the first years of the eighteenth century the growth of the industry was so gradual that it did not appeal to the mother country as a menace to her own cherished manufactures. However, in 1719, parliament made an attempt to pass a bill containing a clause to the effect "that none in the plantations should manufacture iron wares of any kind out of any sows, pigs or bars whatsoever." Although this proved abortive, the manufacturers of England continued to watch the colonies with a jealous eye and in 1750 succeeded in putting through a bill forbidding American smiths to build "any mills for slitting or rolling iron; or any plating-forge to work with a tilt hammer; or any furnace for making steel."

This did not abolish furnaces and forges, in fact various of the colonies exported pig iron and bars to England, not because the mother country wished to encourage the colonial furnace men and smiths, but because she needed the material. Even this was frowned on by furnace operators of England who felt that their sacred rights were being invaded; but the common necessity overrode their complaints.

Neither was the bill forbidding mills retroactive, so that such shops as contained the prohibited "slitting or rolling mills or plating-forges for working with a tilt hammer" were able to continue in operation. These, however, were in the decided minority and forges and furnaces were the sole representatives of the industry in most of the colonies; forges alone, in several of them.

Although Pennsylvania did not begin to make iron until 1716 its progress was rapid and it soon took its place in the front ranks. By 1734 there were some 20 bloomeries and other iron works near Philadelphia. This number increased rapidly and Pennsylvania further proved its progressive spirit by being the first of the colonies to substitute blast furnaces for bloomery forges, a change which was initiated about 1730. By 1759 foreign observers noted that the Pennsylvania industry was more advanced than that of any other of the colonies. That this advancement was of inestimable value in carrying on the Revolution is evidenced by the references we find to various furnaces which made war materials. For instance, we hear of the Martic furnace with its two forges located on Pequea

creek, in the heavily wooded country in the Susquehanna hills of western Lancaster county. Because of its isolation it was able to operate undisturbed throughout the war, making muskets and other war supplies for the continental army. Another forge of the day, which has a world repute, was located on Valley creek and will always be remembered as Washington's headquarters.

In New York state the Stirling forges of Orange county made history, along with the famous chain which was stretched across the Hudson river at West Point to stop the British fleet. Here also were forged the anchors for the first American battleships. That the importance of the iron industry in war making was recognized by the colonial governments, is revealed by the fact that the New Jersey legislature passed an act exempting iron workers from military service.

1812 *Gave Industry Impetus*

In 1812, war once more called our industral resources into play, with the iron industry taking a leading role. By this time western emigration was in full tide and forges and furnaces were beginning to spring up along the path to the wilderness. One of these, the Bourbon furnace of Bath county, Kentucky, built in 1791, had made its chief business the supplying of pots, kettles and blacksmith iron to the pioneers. In 1812 it contracted to make artillery supplies for the United States government and it was with cannon ball, grape shot and chain shot from this furnace that General Jackson, in 1815, won the famous victory over the British at New Orleans.

All this activity had given a tremendous impetus to American iron making and alarmed England more than ever, now that she could no longer prohibit it by act of parliament. Lord Brougham in 1816 in a speech before parliament advocated the increased exportation of British goods to the United States, declaring that "it is worth while to incur a loss on the first exportation, in order by the glut to stifle in the cradle these rising manufactures in the United States which the war has forced into existance, contrary to the natural course of things."

This policy, combined with the reluctance evidenced by the colonies to protect their infant industries by a high tariff, was successful in keeping the industry from making the advances which could have been logically expected under the circumstances. Also, England was still able to hamper the new country by continuing in effect certain prewar legislation, first aimed at colonial development, but equally hard on the new government. These laws forbade the exportation from England of any mills, machines, plans of machines, etc., and remained on the statute books until 1845, while laws prohibiting artificers from migrating from England to other countries and disclosing there the secrets of their trade, continued in force until 1825.

Shipbuilding Plans 100 *Years Ago*

One outgrowth of the war of 1812 which is of peculiar interest today when the country has turned its attention so generously to the shipbuilding program, is found in the fact that in 1814 Robert Fulton submitted to the President of the United States the plans for the first steam warship. During a sojourn in Paris, 1797-1804, he had invented a submarine or plunging boat which he called a "torpedo." This although successful in navigating under water was very slow and was rejected by the French government. In 1807 he had proved that boats could be propelled by steam. Now he proposed to build a warship, a floating battery, with the same means of propulsion. With hopes of using her against the British, work on her was started immediately. The dimensions of the craft were to be as follows:

	Feet
Length	150
Beam	56
Depth	20
Water wheel, diameter	16
Water wheel, length of bucket	14
Water wheel, drip of bucket	4
Engines, diameter of cylinder	4
Engines, stroke	5
Boiler, length	22
Boiler, breadth	12
Boiler, height	8

The total estimated cost of the craft was $320,000, or about the cost of a first-class sailing frigate. As is frequently the case this did not prove an accurate estimate. Outside circumstances such as the scarcity of copper, lead, iron, coal and labor made construction slow and expensive. The blockade which England was maintaining off our shores made the procurement of material difficult and as labor was serving in the army or in various capacities on the Great Lakes where naval battles were being fought, wages were high. But in spite of these hindrances the work was pushed and the boat finally launched before a group of wondering onlookers.

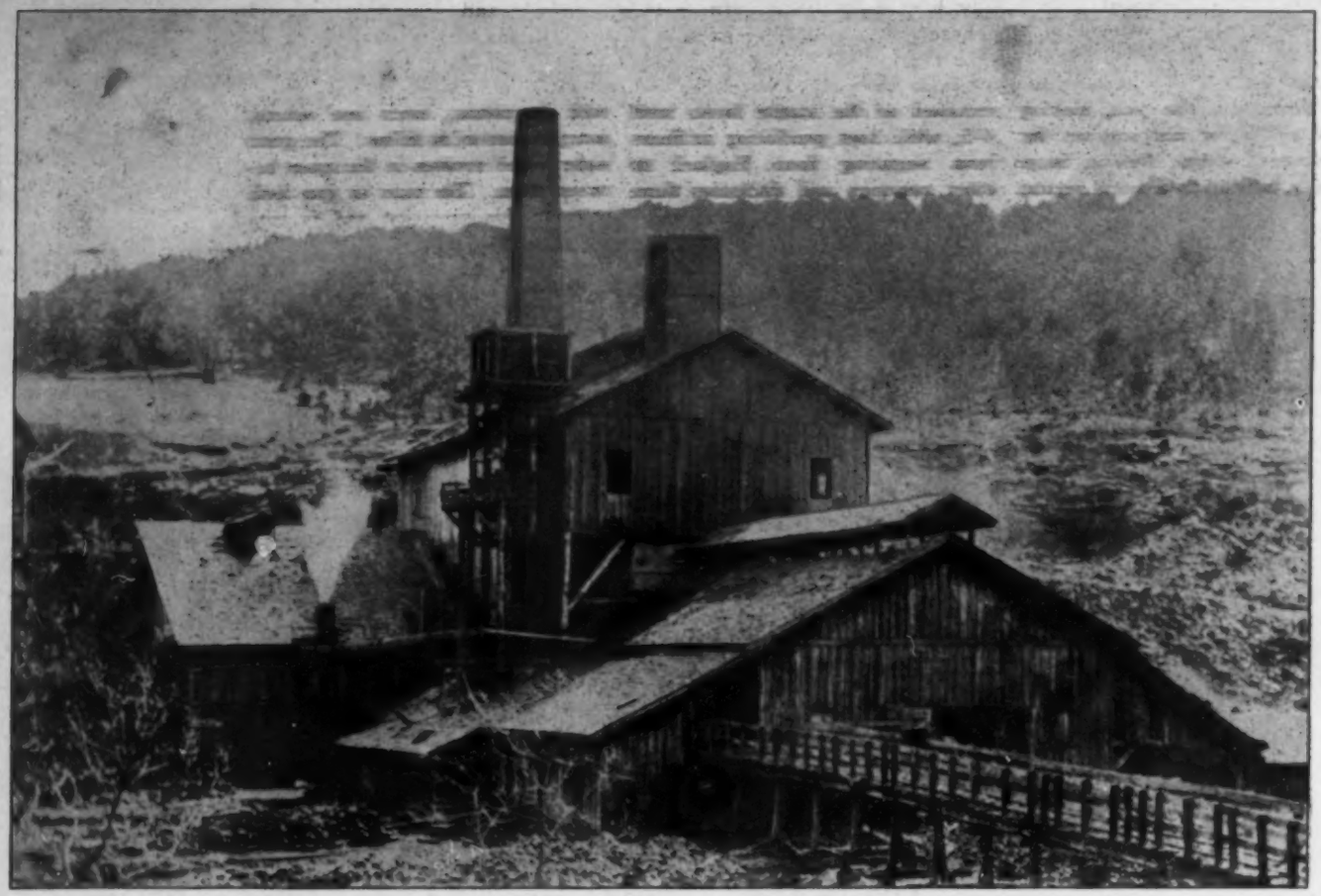
An eye-witness describes her in the following words: "She is a structure resting on two boats and keels, separated from end to end by a canal 15 feet wide and 156 feet long. One boat contains the capacious cauldrons of copper to prepare her steam. The vast cylinder of iron, with its pistons, levers and wheels, occupies part of its fellow. The great water wheel revolves in the space between them. The main or gun deck supports her armament and is protected by a bulwark 4 feet, 10 inches thick, of solid timber. This is pierced by 30 portholes, to enable as many 32-pounders to fire red hot balls."

To show that she was absolutely the *dernier cri* in boats and also that he still had faith in his earlier invention, in spite of the verdict of the French government, Fulton planned that the warship should be furnished "with four submarine guns, two suspended at each end, to discharge a 100-pound ball into an enemy 10 or 12 feet below her water line" and also that she was to "have an engine for throwing an immense column of hot water upon the decks or through the ports of an opponent."

Description of the Warship

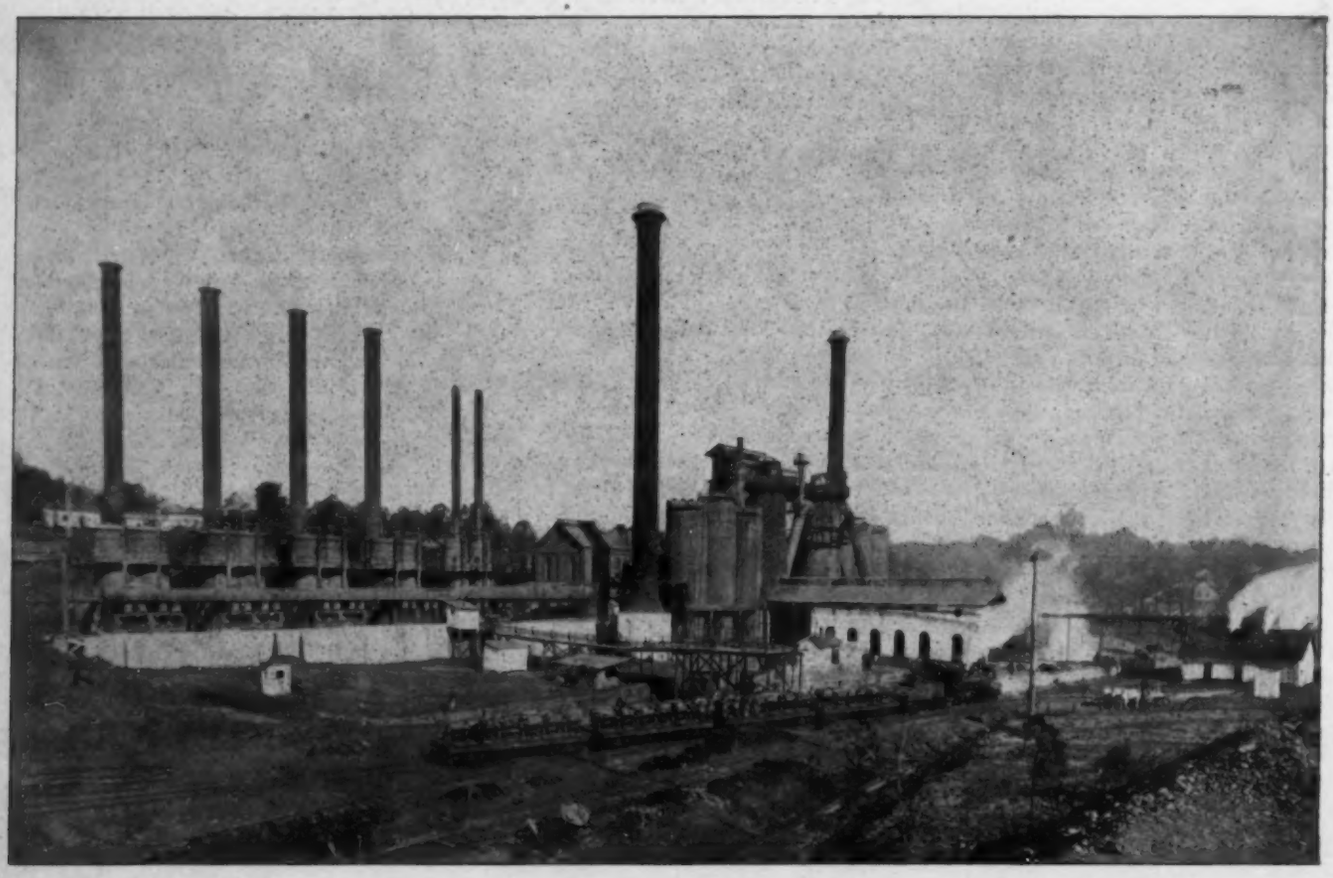
England was vastly interested in the attempt. As evidence that the power of rumor was as formidable then as now, it is instructive to read the description of the steam warship published by the *Edinburgh Evening Courant* of Aug. 31, 1815, which announces that it has been at infinite pains to procure "full and accurate information." Descriptive data printed in this article give the warship's length as 300 feet; breadth 200 feet; thickness of sides 13 feet, the sides being formed of alternate oak plank and cork wood. "She carries 44 guns, four of which are 100-pounders, quarter deck and forecastle guns, 42-pounders. Further to annoy the enemy attempting to board, she can discharge 100 gallons of boiling water in a minute, and by a mechanism brandishes 300 cutlasses with the utmost regularity over her gunwales; she works also an equal number of heavy iron spikes of great length, darting them from her sides with prodigious force and withdrawing the same every quarter of a minute."

Though the boat was not as fearsome as this alarming account intimated, she was nevertheless a success. She moved with remarkable celerity, at an average of five and a half miles per hour, and even against the three and a half knot ebb of the East river she made headway at the rate of two miles an hour. She obeyed her double helm perfectly. Explosion of powder caused little concussion and the boat's machinery did not seem to be affected by it at all. Her progress during the firing was steady and uninterrupted. New York,



THE ABOVE VIEW OF THE IRONDALE FURNACE IN 1872 SHOWS THE MEANS USED BY THE SOUTH IN ITS INDUSTRIAL GROWTH AFTER THE CIVIL WAR

THE OXMOOR FURNACE, SHOWN BELOW, HAS BEEN FURNISHING IRON FOR USE BY THE UNITED STATES AND ITS ALLIES. THE SOUTH FACES RECONSTRUCTION NOW AS AN IMPORTANT FACTOR IN AMERICAN INDUSTRY



which had feared enemy attacks, was now considered invulnerable.

Despite her successful trial trip she was never fitted up with all the equpment planned for her, due to the death of her designer and the end of the war. Great Britain soon followed this country's lead and started the construction of a steam battleship, but in the end converted it into a frigate. This country, however, soon built a second, of much the same type as the DEMOLOGUS, as Fulton had named the first boat, and in less than 50 years all battleships were steam propelled.

Country Begins Expansion

The building of the DEMOLOGUS was evidence that lack of protective tariff and determined competition of a stronger power could not strifle industrial enterprise in the new country just beginning to work out its own salvation in its own way. A few correlated facts and dates, showing the progress following the two wars will further illustrate the stimulus given to American industry by the colonies' separation from England. In 1801 the first chain bridge in the United States was built over Jacob's creek, in western Pennsylvania, by Judge James B. Finley, of Fayette county. The year 1803 marks the beginning of the iron industry in Ohio, for in that year Daniel Eaton began the construction of the Hopewell furnace, the first furnace in the state. It was finished in 1804 and stood on the west side of Yellow creek, about one and a quarter miles above its junction with the Mahoning river.

In 1807 short railroads for hauling stone, gravel and coal were built. The production of cast iron and pig iron in 1810 amounted to 53,908 tons while 917 tons of steel were manufactured. A patent for "rolling iron round, for ship bolts and other uses" was granted to Clemens Rentgen of Chester county, Pennsylvania, in 1810. In 1812 and 1813 rolled round iron for the navy was made in Mr. Rentgen's Pikeland works, under this patent. The first rolling mill at Pittsburgh was built in 1811 and 1812 by Christopher Cowan. Sheet iron, nail and spike rods, shovels, chains, hatchets, hammers, etc., were made at the mill.

White & Hazard constructed the first wire suspension bridge in the United States, and perhaps in the world, across the Schuylkill river in 1816. The first rolling mill erected in the United States to roll puddled iron bars was built by Isaac Meason in 1816-17. This was located at Plumsock, on Redstone creek, Pennsylvania. In 1816 also, Dr. Charles Lukens purchased the Brandywine rolling mill at Coatesville, Pa., from Isaac Pennock; this was the first mill in the United States to roll boiler plates.

First American Locomotives

The first iron steamboat in the country, the COLORUS, was built at York, Pa., in 1825. Two years later, in 1827, the Baltimore & Ohio railroad secured a charter of construction from the Maryland legislature. This was the first railroad to carry both freight and passengers. But it was not until 1829 that locomotives superseded horse cars on American railroads; the first American built locomotive appearing in 1830.

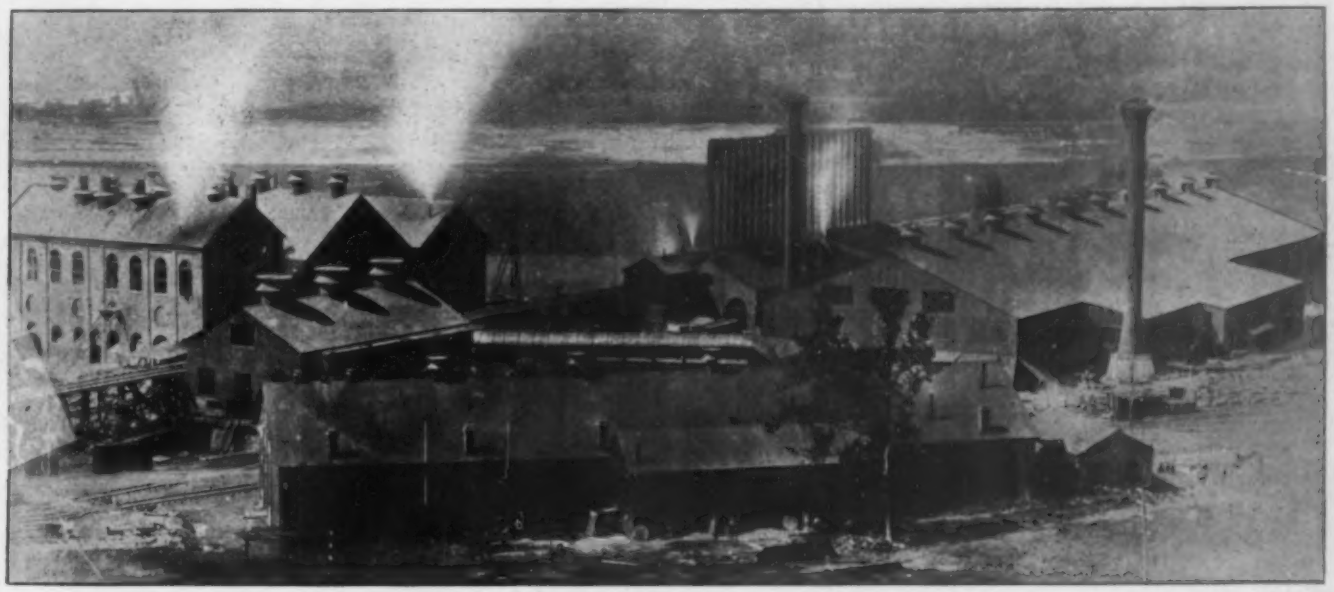
One could continue "firsts" indefinitely, but it is to be concluded that although periods of depression occurred in the industrial life of the country, the tendency toward development and invention which immediately followed the termination of the Revolutionary war saw no real slackening in after years. Pennsylvania continued pre-eminently the iron and steelmaking state of the union and names still familiar today were already beginning to appear on the industrial horizon.

Other American Advancements

Although dates and statistics are dry at best there are still a few more which are important milestones in the development of the industry. In 1832, crucible steel of the best quality was made in commercial quantities, entirely from American materials, at Cincinnati, by Dr. William Garrard and his brother, John H. Garrard; 1834 saw the first practical application, in the United States, of the hot blast to the manufacture of pig iron. This took place at Oxford furnace, New Jersey, under the auspices of William Henry, manager.

Coke was first used successfully in a blast furnace in the United States by William Firmstone, at Mary Ann furnace, in Huntington county, Pennsylvania, in 1835. Finally, and of paramount importance, the first shipment of iron ore from the Lake Superior district, a shipment of only 10 tons, was made in 1850. Three years later Lake Superior ore was used for the first time in a blast furnace in Pennsylvania. Seventy tons of the ore were shipped from Erie by canal and used in the Sharpsville and Clay furnaces, in Mercer county.

It is after the Civil war, however, that we can begin to trace with more



EDGAR THOMPSON RAIL MILL (1876) IN THE EARLY DAYS OF AMERICAN RAILROAD EXPANSION

clarity the history of some of the larger companies which have figured so prominently in providing the sinews of steel for the present war. We find in that period, also, the birth of what was destined to become the second Pennsylvania of the country, the Birmingham, Ala., district.

Effect of the Civil War

When the Civil war finally burst into flame, the country was suffering from a period of business depression. The Mexican war had been of such minor importance that it made scarcely an impression on the iron industry. Bar iron at Philadelphia in May, 1846, when the war started, was selling at $92.50 and February, 1848, the close of the war, found it quoted at $85 a ton. The largely increased production caused by the Civil war, and the passing of the Morrill protective tariff in 1860 turned the path of the industry along more prosperous lines.

A study of the accompanying price charts is sufficient to demonstrate just how warmly the beneficent mantle of prosperity had settled on the shoulders of the ironmakers, by the time the smoke of battle had cleared away. Not until 1875, ten years after the end of the war, did bar iron fall once more to the price it commanded when the war began and pig iron required 11 years, until 1876, to make the descent—this despite the fact that a panic swept the country in 1873. Henry M. Casson in his *Romance of Steel*, says:

"With the Civil war came the first large orders and continuous business. Every plant ran night and day. The output of iron nearly doubled, and the price jumped from $18.60 to as high as $73.60 per ton. Of the $3,000,000,000 that the war cost the federal government, a goodly share went to the iron men. Uncle Sam was the best customer they had ever known. They had a surplus in the bank, at last—a store of capital that enabled them to do business on a larger scale."

The Thomas Iron Co., founded in 1854, reports that the highest price for iron received by that company was on Aug. 20, 1864, when they were paid $75 per ton at the furnace for No. 1 X grade. Expert labor was so valuable that the company paid certain employes, drafted into the army, $200 each, "toward defraying the expenses of procuring substitutes." This policy was reversed, however, when in 1863 Pennsylvania was invaded. The company then offered to continue to pay wages to men in its employ who would volunteer for the defense of the state.

Although the high war prices gave many a company the capital with which to develop its business in post-war times, the profit then, as today, was not so huge as might appear on the face of things. For instance, the Thomas Iron Co., between July, 1864, and December, 1866, paid the United States government $200,423.83 in taxes. Another thing which made profits less than they appear when reading the figures, was that gold was selling at 256½ to 257⅛ in 1864. Despite these facts, however, profits were sufficiently large so that for many a company they formed the stepping stone to further development and future prosperity.

The war period, then, was one of expansion and this continued during the post-war period. When the war began the Thomas Iron Co. owned two furnaces at its Hokendauqua plant. These had been built in 1855. During the war two more were erected and in 1873 and 1874 respectively, Nos. 5 and 6 went into blast. Another furnace was added when the company acquired the Lock Ridge Iron Co., Alburtis, Pa., in 1868 and a second was put into blast at this plant in 1869. Later properties absorbed by the Thomas Iron Co. were the Keystone furnace, Island Park, Pa., in 1882, and the Saucon Iron Co., Hellertown, Pa., in 1884.

Causes of Industry's Growth

Certain circumstances combined to make it almost impossible for the iron industry to do anything but advance during this period. These conditions can be summed up, in brief, as follows: War capital to finance new plans was plentiful; western expansion was booming and railroads were a vital necessity to tie the country together; men returning from war were being given western lands which increased the normal western migration; and, finally, the bessemer process of making rails was discovered.

These fortuitous circumstances conspired to make successful one of the greatest enterprises the country has ever seen. In 1864 Andrew Carnegie in company with Thomas N. Miller, Aaron G. Shiffler and J. L. Piper formed an organization for erecting a mill on Thirty-third street, Pittsburgh. This company was called the Cyclops Iron Co. and although the mill they built was not an immediate success it was the nucleus about which the Carnegie Steel Co. was to form. It combined in 1865 with the Kloman-Phipps Iron City Forges, a company in which Thomas Carnegie,

VIEW OF MODERN PLANT SHOWING COMPLETE EQUIPMENT FOR MANUFACTURING PIG IRON AND STEEL

Andrew's younger brother, was an active partner. They had started operations in 1858 with one small forge, but a combination of skilled workmen and war prosperity had taken them a good step along the road to success. At the time of the merger, the combined companies were christened the Union Iron Mills Co., and to this day they are known as the Upper and Lower Union mills.

Immediately after the merger the war ceased and so did the government contracts. For a time stagnation loomed ahead. But soon business was actively occupied with the building of iron and steel bridges, with railroad building and with reconstruction work both south and north. As a result, the Keystone Bridge Co. came into being on April 25, 1865, with a capital of $300,000, as a part of the Carnegie properties, and in the early seventies the famous Edgar Thomson works for making bessemer rails was completed. The success of this and other later extensions of the Carnegie Steel Co. are too well known to need recounting.

There are many other companies which got their initial impetus at the time of the Civil war and many which, in existence at the beginning of the war, came through with flying colors and with renewed vigor at the end. The Cambria Steel Co., where William Kelly carried on his experiments with the bessemer converter, might be instanced as one of these, while the old Sharpsville, Pa., furnace, built in 1846 and still in operation is another interesting veteran of the war.

War's Effect in South

But the expansion was not all in the North. The South, deprived of northern iron upon which it had been accustomed to rely to a great extent, and now in dire need of more than its usual supply of iron and steel, was driven to develop its truly great resources. The Alabama iron fields began to take their proper place industrially. Furnaces sprang up in backwoods spots. Some of these made iron throughout the war, but were destroyed as the Union troops, advancing through the country, stumbled upon them. Accounts of old southern furnaces are apt to read as follows:

"The old Red Mountain Iron Co.'s furnaces are located five miles from Birmingham, at a station called Ironton. These furnaces were commenced during the war and the company was one of the richest in the south. But one of the furnaces was completed and after being in blast a few months was burned by General Wilson. * * * These furnaces have been rebuilt and enlarged." Or, "This furnace (Irondale) is situated five miles northeast of Birmingham, in Shades Valley. It was built during the war and iron was made for casting cannon. After being out of blast for over two years it was leased to the Jefferson Iron Co. of Pennsylvania."

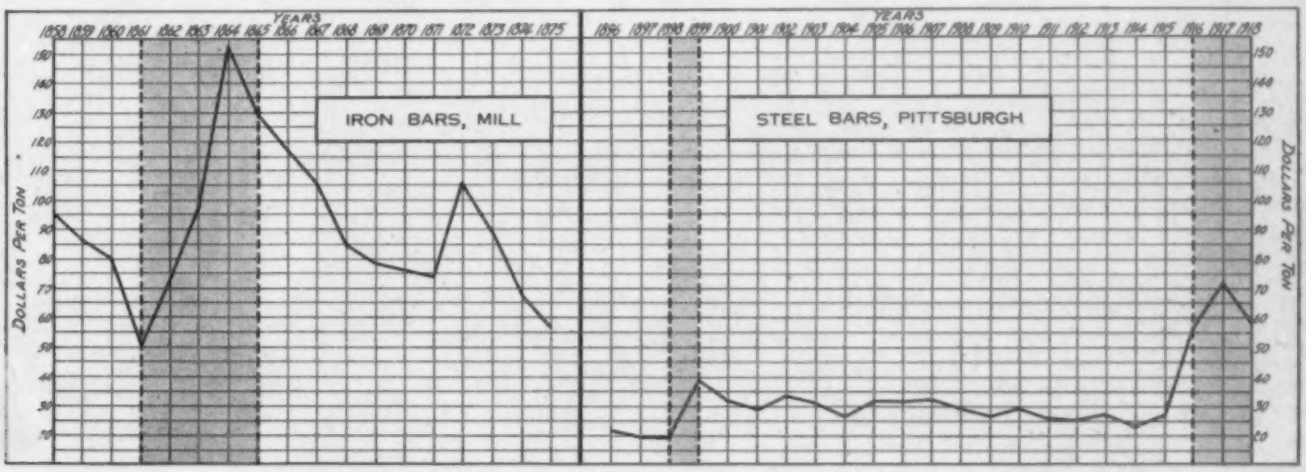


CHART SHOWING TREND OF REPRESENTATIVE PRICES IN WAR AND POST-WAR PERIODS

Selma, Ala., Was Iron Center

The point about which all iron-making centered at that time was naturally Selma, Ala., where General Gorgas had established the arsenal and naval foundry for the confederate states. Out of a group of ramshackle cotton sheds, he improvised great shops where every type of military equipment was manufactured. A multitude of iron works of varied character sprang up about the arsenal. It is estimated that 10,000 confederate government workers were employed at Selma alone.

Contributary to Selma and furnishing the arsenal with its materials, were 16 blast furnaces and six rolling mills. This does not include the forges, bloomeries and blacksmith shops which did yeoman service. Of the furnaces and rolling mills, every one was in time destroyed by the invading troops, as were practically all of the minor shops, also. But the seed had been sown and from six of the 16, new furnaces grew up after the war, to replace the old. These six were the Irondale, Shelby, Brierfield, Oxmoor, Salt Creek and Rock Run furnaces. Two of these later furnaces are still in operation; the Oxmoor, owned by the Tennessee Coal, Iron & Railroad Co., and the Shelby, owned by the Shelby Iron Co. To build the Oxmoor furnace, Colonel Gilmer and John T. Milner secured the aid of the confederate government, so that it was practically a war measure. The Shelby furnace is recorded as having furnished to the government "iron of a quality to be used in armor plate for rams and gunboats, an iron of very superior quality."

Center Moves Northward

After the war, as southern industry gradually recovered from the staggering blow which had been dealt it, the center of activity changed and moved northward from Selma, for it was to the north that the iron was located and a far southern location for the plants was no longer a military necessity. Col. James R. Powell, therefore, in 1871 formed the Elyton Land Co. for the purpose of founding and developing the city of Birmingham in the heart of the iron district. At the end of the first year of the company's existence, the town had a population of 800 persons and in the second year this increased to 4000. The growth continued steadily from that time to the present day, going from 26,178 in 1890 to 38,415 in 1900 and reaching 132,685 in 1910. From which it is evident that even to the vanquished, Thor's hammer can bring

strength and eventual prosperity.

A discussion of the results of the Civil war, as it affected the iron industry, demands mention of the MONITOR and the MERRIMAC, for in the initial clothing of those boats in iron plates we see the genesis of the huge armor plate plant of the Bethlehem Steel Corp. which has borne so huge a burden in the conflict which has just closed.

Before the Civil war one armor-plated battleship had been built by England and France each, but this country had not yet seen fit to add that type of boat to its navy. In May, 1861, however, the confederate secretary of the navy wrote: "I regard the possession of an iron armored ship as a matter of the first necessity." In July he ordered that the MERRIMAC, which had been sunk and partially burned when the Gosport navy yard was fired, be raised and converted into an ironclad. The North, several months behind the South, in this instance, did not take action toward acquiring an armored vessel until August of the same year. Then the navy advertised for plans and offers for ironclad steamers "of light draft suitable to navigate the shallow rivers and harbors of the confederate states." John Ericsson submitted plans which he demonstrated as practicable, although they were first rejected by the board. The MONITOR'S keel was laid Oct. 25, 1861, and she was launched Jan. 30, 1862. The South, working with fewer facilities at its command, was able to complete the MERRIMAC but a short time before the MONITOR was ready for action and the fate of the two vessels is well known.

War Spurred Industry

The Civil war then, was an active and positive spur to the iron industry both North and South. Manufacturing reacted as to a direct stimulus. Although for a time, while the first stages of readjustment took place, a slight period of depression manifested itself, this did not assume the proportions of a panic, by any means, and was quickly bridged over. Naturally, prices could not remain at a war level, but their descent was gradual.

This fact is mentioned by Samuel Croxton, one of the pioneers of the pig iron business, in recalling the experiences of the industry during the period of reconstruction. "At the close of the Civil war," he said a few days ago, "we were all at sea as to what the future had in store for us. In 1861 the price of pig iron was about $27 a ton; as the war continued the price continued to ascend until it reached its high level in 1864, when pig iron sold for $35 in gold, or $80 in paper. By the winter of 1865, the price of No. 1 foundry pig iron had gone down to $60 a ton and then gradually dropped to $30, in 1870. In that year it took an upward turn and in 1872 sold as high as $55 a ton. Then it struck the down grade again until in 1877-78 it got as low as $18. This was followed by an upward trend until the price broke in 1881 and within six months dropped from $45 to $27 a ton."

Mr. Croxton said that fuel for each ton of iron produced at the Dover, O., furnace of the Tuscarawas Coal & Iron Co. cost $23.35 in 1865, only raw coal being used. Thirty-two years later the fuel, which was Connellsville coke, cost $2.40 a ton. It took 5300 pounds of blacksand ore, costing $10.45 to make a ton of iron in 1865, while in 1897 better iron was manufactured from 3800 pounds of Lake Superior ore, costing $4.90. While 3060 pounds of limestone, costing $3.35 was required in the making of a ton of iron in 1865, in 1897 the requirement was but 760 pounds, costing 32 cents. The labor cost was reduced from $10.70 to 88 cents. The total cost of producing one ton of pig iron in 1865 was $51.10; in 1897 it was $9.78."

In 1865 and in 1919

Mr. Croxton saw a parallel in the uncertainty which prevailed in the days immediately following the close of the Civil war and the present time: "In my opinion there will be a gradual lowering of prices," he said. "The world has been bent on destruction for too long a period to escape the penalty. It is true that work which has been held back, and the demands of Europe, will serve to keep us busy, but the pace will not be as strenuous as it has been. Presently we shall be called upon to absorb millions of our men into our industries. Labor must remember at this time that its interests are bound up with those of the manufacturers; if the latter must make sacrifices, there is no other way out of it but for labor to make them also."

Another business man of the Civil war period wrote: "When the war ended we all knew we should have a panic. Some of us, like Mr. Hoar, expected that greenbacks and volunteers would be disbanded together. Others expected gold to fall to 101 or 102 in a few days. Others saw a collapse of manufacturing industry owing to the cessation of government purchases. But we all knew a crisis was coming and having set our houses in order accordingly, the crisis, of course, never came."

Conditions following the present war are bound to differ in many respects from those of the post-Civil war period. For one thing, the country's resources naturally are developed to a much higher point than they were then. Nevertheless, new avenues have been opened up by the present conflict which will be further extended in the days of peace and will serve to expand still more the already huge field of the iron and steel industry.

Demands From New Fields

Many sources of demand, not in evidence at the close of our previous wars, now hold high rank as consumers of steel. The motor truck has ceased to serve merely as an agent for delivering goods within restricted areas. It has become a competitor, and an auxiliary, to the freight transportation system of the country. The airplane, from being an interesting subject of speculation and experiment, has become a practicable vehicle, which should soon vie with the automobile as a means of transportation. Shipbuilding has returned to America and as a result plates are being rolled and engines are being built at a rate never before attained.

History, we know, repeats itself. Just as previous wars have encouraged invention and expansion so this war promises to do. Great Britain favors a rail route from the English channel through to India which will tie even more closely the colony and the mother country. Asia is expected to prove a center for railroad building for years to come while the great African continent is practically undeveloped. Airplane service has been established between England and the continent and although the fare is still more or less prohibitive it should be but a short time before the airplane will be on competitive terms with other agencies of transportation. In this country we are promised airplane service by the coming May, although very few of the details of the project are as yet known.

This hurried sketch of the industry's history reveals the stimulating influence which earlier American wars have exerted. The development of the motor truck, the airplane, and of ships is merely indicative of a few of the lines which such expansion might follow at this time. One permanent benefit of the war, if past precedents can be relied upon, will be the development of greater facilities for transportation. The Revolutionary war gave to America her shipping supremacy. The Civil war gave this country its railroad supremacy at the same time that its marine power was being forfeited. The war of German aggression may prove the instrument of giving this country supremacy not only on land with railroads and commercial trucks but on the ocean with American-built ships.

Necessity Halts Industrial Waste

Conservation Program Carried Out Under Government's Supervision to Save Material and Effort for War Production Accomplishes Surprising Results—Economies Promise to Remain in Permanent Effect—Work to Continue

BY L. W. MOFFETT

EXTRAVAGANCE is a habit of the industrial life of the United States. Arising from the enormous resources of the nation, together with its characteristic of individualism, this tendency had grown rampant. In times of peace often it was frowned upon. Aside from being deplored, however, nothing was done to stop it further than by the making of suggestions by this or that person, or by this or that organization. In the meantime it flourished with all the vigor of a patch of weeds in an unkempt backyard. When the god of war arose in his might in the defense of the nation, a halt was called on all wastefulness. Its proscription was necessary to victory. Manufacturers, responding loyally to the national call, gave the heartiest co-operation to the demands to conserve supplies of steel, and innumerable other products. Involved in this process was the elimination of an almost unlimited number of types, varieties and special brands of goods. Individual, but unnecessary, kinds of products were cast aside, duplication avoided, and simplification of manufacture developed. The program of conservation had proceeded to a surprising extent, and was being pushed forward rapidly, with many more schedules of conservation about ready to go into effect, when hostilities ceased. The sole purpose of the program having been the winning of the war, orders for conservation issued by the conservation division of the war industries board no longer are applicable insofar as their immediate object is concerned.

Shall Industry Resume Waste?

At this point a big question intrudes itself. Does industry want to return to its methods of wastefulness which had been eliminated, and which were in process of elimination? Does it dare do it in the face of keen international competition for trade attendant upon and to be followed by the period of economic readjustment? Based upon the co-operative idea in industry, and representing the discarding of the theory of competition so long entertained by the government, it can and should be continued in peace and not thrown aside now that the cause which produced it has passed. Compensation should be derived from the law of war necessity. Sponsored by the government, the movement should be encouraged by the government to aid in increasing the commercial welfare of the nation.

THE conservation division was essentially a war making instrumentality. Its purpose was to take from civilian industry every particle of capital and labor and material and equipment that it was possible for the industries and trades to release in order that the resources and facilities might be used to win the war; and always to endeavor to do so with the least possible disturbance to the business organization."—A. W. Shaw, chairman conservation division of war industries board.

While undoubtedly some plans of conservation adopted to meet war needs proved irksome and have been abandoned, those devised for the most part were of a nature which can be maintained profitably in times of peace. That some of them will be continued voluntarily is assured. Many manufacturers, some of whom at first were skeptical regarding the practicability of resorting to these plans, and felt their adoption would be hurtful to them, now have admitted that they are sound in economic principle and will be made permanent. Results obtained even during the short time the conservation program was in effect were so great that the latter gained wide popularity. Especial praise in this direction has been sounded by Chairman Bernard M. Baruch of the war industries board. Repeatedly, Mr. Baruch has expressed the hope that the work of the conservation division of that organization, so ably conducted by its chairman, A. W. Shaw, and his corps of aids, could be continued permanently.

Permanent Conservation Aid

Definite action has grown out of this suggestion and it has been officially announced by the department of commerce that it will incorporate permanently the conservation section of the war industries board. President Wilson has made an allotment of $100,000 for carrying on by the department of commerce the work heretofore handled by the conservation branch. Secretary Redfield has asked congress to appropriate a like amount to insure the continuation of this work during the remainder of the fiscal year after the formal declaration of peace. It ought to be the aim of those in charge of its application to see to it that the work is continued as effectively as it has been performed under the supervision of Mr. Shaw, who, it is said, does not want to take over the task as a permanent matter. In private life Mr. Shaw is editor of *System*. Much aid in establishing the program of conservation was furnished by the chamber of commerce of the United States through its war service committees and the latter still are in a position

to act efficiently in this capacity.

No time should be lost if this work is to be allowed to go forward. The conservation division now has completed the work assigned to it, for that related to the winning of the war and has fulfilled its obligations. It remains for the public and business to decide whether they want the work continued, and, if so, how? In view of the fact that many things done by the division could be dispensed with in peace times, the work, if to be made permanent, readily could be reorganized to meet conditions connected with and followed by the period of readjustment.

The history of the conservation division and the precise purposes for which it was organized, followed by results it accomplished, with especial bearing upon the steel industry, represent an interesting recital of the accomplishments made possible by a union of efforts.

The division was started the first of April, 1917, on the eve of declaration of war against Germany, as a commercial economy board of the council of national defense. In May, 1918, it was amalgamated with the war industries board. Its function, as expressed by President Wilson to Mr. Baruch last March, was the conservation of resources and facilities by means of scientific commercial and industrial economies.

Production Simplified

Taking up its tasks, it dealt entirely with business men. It found in a large number of industries a multiplicity of sizes and types and features of products that was greater than needed. Conferences were held with manufacturers, and suggestions were received from and made to them with a view to simplifying production. The goal was conservation.

Two main ideas were in mind. First, it was sought to secure economy in manufacturing operations in the plants. Secondly, it was desired to simplify these lines through a substantial reduction of the quantity of material carried by manufacturers and in the quantity of finished products, and to reduce the amount of capital tied up in manufacturers' and wholesalers' stocks throughout the country. It was the policy of the division to eliminate the wasteful and less essential uses of labor, materials, equipment and capital in all kinds of business, rather than to try to set up a categorical classification of essential and nonessential industries.

This policy made it possible for many industries to continue business, preserving the nucleus of their organizations, whereas if they had been stigmatized as nonessential it would have taken them a long time to recover their regular processes. The division in pursuing this system was looking to the time that industry could start up when war requirements permitted, a thing that now has hap-

Farm Wagon Grade of Gear in One Capacity

Cast Skeins, Steel Skeins, Steel Axles

Half Slip Tongue Front Gears and Rear Gears with Stationary Reach Not Considered

ASSORTMENT MANUFACTURED PRIOR TO WAGON STANDARDIZATION

	VARIETY	Front Gear			Rear Gear—Drop Tongue								Total Variety	
					Regular Stakes					Special Stakes				
		Drop	Slip	Total	6"	10"	12"	13"	15"	Stand Loop	Club	Team	Rear	Front and Rear
1	Wide Track, Drop Tongue, C. S., Reg. H. W., Rectangular Reach	1	0	1	1	1	0	1	0	1	1	1	6	7
2	Narrow Track, Drop Tongue, C. S., Reg. H. W., Rectangular Reach	1	0	1	1	1	0	1	0	1	1	1	6	7
3	Wide-Narrow, Drop Tongue, C. S., Reg. H. W., Rectangular Reach	0	0	0	1	1	0	1	0	1	1	1	6	6
4	Total, No. 1-2-3	2	0	2	3	3	0	3	0	3	3	3	18	20
5	Cast, Drop, for Low Height Wheels, Duplicating Base Figures, No. 4 except Front Gear	0	0	0	3	3	0	3	0	3	3	3	18	18
6	Cast, Slip, for R. H. W., Ditto No. 4	0	2	2	3	3	0	3	0	3	3	3	18	20
7	Cast, Slip, for L. H. W., Ditto No. 5	0	0	0	3	3	0	3	0	3	3	3	18	18
8	Total Cast Skeins, Rectangular Reach, all Types, No. 1 to 7 inclusive	2	2	4	12	12	0	12	0	12	12	12	72	76
9	Round Reach, Drop, Slip, for Regular and Low Wheels. All types listed above No. 8 except Front Gear	0	0	0	12	12	0	12	0	12	12	12	72	72
10	Band Coupling Reach, Ditto No. 9	0	0	0	12	12	0	12	0	12	12	12	72	72
11	Steel Skein Variety Duplicates, all Types Listed for Rect. Round Reach and Band Coupling Gears, No. 8-9-10	2	2	4	36	36	0	36	0	36	36	36	216	220
12	Steel Axles, Ditto No. 11	2	2	4	36	36	0	36	0	36	36	36	216	220
13	3 x 4" Rect. Reach, Cast, S. S., Regular Stakes, Drop and Slip, Wide and Narrow Track, Reg. and Low Wheels	0	0	0	12	12	0	12	0	12	0	12	60	60
14	Block Reach, Cast, S. S., Steel Axle, Regular Stakes, Narrow Track, Regular and Low Wheels	6	0	6	0	12	0	12	0	0	0	0	24	30
15	44" Width Between Stakes, Rectangular Reach, Cast, Drop and Slip, Wide Track, Reg. and Low Wheels	0	0	0	12	12	0	12	0	0	0	0	30	30
16	4' 10" Track, Rect. Reach, Cast and St. Axle, Steel Skeins, Drop and Slip, Regular and Low Wheels	3	3	6	0	12	0	12	0	0	12	0	36	42
17	5' 4" Track, Rect. and Round Reach, Cast, Steel Skeins, and Steel Axle, Drop and Slip, Reg. and Low Wheels	3	3	6	0	24	0	24	0	0	24	0	72	78
18	Grand Total — Front and Rear Gears Required from No. 8 to 17 inclusive	18	12	30	132	180	0	180	0	120	144	120	876	906

It takes one front and one rear gear for a wagon, and as the assortment is governed by the rear gears the total front and rear gears necessary to match warehouse stock, to ship one wagon of any one type listed is 1752. An order for two of the same type could not be filled.

Farm Wagon Grade of Gear in One Capacity

ASSORTMENT MANUFACTURED ACCORDING TO GOVERNMENT RECOMMENDATION

	VARIETY		Front Gear			Rear Gear—Drop Tongue									Total Variety	
						Regular Stakes					Special Stakes					
			Drop	Slip	Total	6"	10"	12"	13"	15"	Stand Loop	Club	Team		Rear	Front and Rear
1	Wide Track	Changed to Auto Track														
2	Narrow Track		1	0	1	1	0	0	1	0	0	0	0		2	3
3	Wide—Narrow															
4	Total Base Figures		1	0	1	1	0	0	1	0	0	0	0		2	3
5	Cast, Drop, for Low Height Wheels, duplicating Base Figures No. 4 except F. Gear		0	0	0	0	0	0	0	0	0	0	0		0	0
6	Cast, Slip, for Regular Height Wheels, Ditto No. 4		0	1	1	1	0	0	0	0	0	0	0		0	1
7	Cast, Slip, for Low Height Wheels, Ditto No. 5		0	0	0	0	0	0	0	0	0	0	0		0	0
8	Total for Cast Skein, Rectang. Reach, All Types		1	1	2	1	0	0	1	0	0	0	0		2	4
9	Round Reach, Drop, Slip, for Regular and Low Wheels. All Types listed above No. 5 except F. Gear		0	0	0	0	0	0	0	0	0	0	0		0	0
10	Band Coupling Reach, Ditto No. 9		0	0	0	0	0	0	0	0	0	0	0		0	0
11	Steel Skein Variety, duplicate all Types listed for Rect., Round Reach and Band Coupling Gears listed		0	0	0	0	0	0	0	0	0	0	0		0	0
12	Steel Axles, Ditto No. 8		1	1	2	1	0	0	1	0	0	0	0		2	4
13	3 x 4" Rect. Reach, Cast, Steel Skein, Reg. Stakes, Drop and Slip, Wide and N. Track, Reg. and Low Wheels		0	0	0	0	0	0	0	0	0	0	0		0	0
14	Block Reach, Cast, Steel Skein, Steel Axle, Reg. Stakes, Narrow Track, Regular and Low Wheels		0	0	0	0	0	0	0	0	0	0	0		0	0
15	44" Width betw. Stakes, Rect. Reach, Cast Drop and Slip, Wide Track, Regular and Low Wheels		0	0	0	0	0	0	0	0	0	0	0		0	0
16	4' 10" Track, Rect. Reach, Cast and Steel Axle, Steel Skein, Drop and Slip, Regular and Low Wheels		0	0	0	0	0	0	0	0	0	0	0		0	0
17	5' 4" Track, Rect. and Rd. Reach, Cast, Steel Skein and Steel Axle, Drop and Slip, Regular and Low Wheels		0	0	0	0	0	0	0	0	0	0	0		0	0
18	Total Varieties—of Front and Rear Gears required, from No. 8 to 17 inc.		1	1	4	2	0	0	2	0	0	0	0		4	8

It takes one front and one rear gear for a wagon and as the assortment is governed by both front and rear gears the total front and rear gears necessary to match warehouse stock to ship one wagon of any one type listed is 16. An order for two of the same type could not be filled.

Charts Prepared by International Harvester Co

THE significance of this reduction in styles in its application to stocks carried in manufacturers' warehouses is illustrated by an incident in the experience of one prominent wagonmaker under conditions as they had existed before standardization and conservation methods were applied. With more than 12,000 completed wagons in his warehouse and with orders for 100 carloads pressing for shipment, it was possible after the most careful checking to find less than one carload to fill the orders. Variations in wheel size, width of track, size of bed and other features had created so many kinds of wagons that the tremendous stock on hand would not meet 1 per cent of the orders received.

© International Film Service

THIS IS AN ILLUSTRATION OF CONSERVATION OF TWO KINDS, HUMAN AND MATERIAL. THE GIRL DRIVER IS BEING TAUGHT AT A FARMING SCHOOL TO TAKE A MAN'S PLACE. IN NO LINE HAS CONSERVATION BEEN MORE SWEEPING THAN IN AGRICULTURAL IMPLEMENTS

pened. The course of the division thus has been justified as a wise one.

In the large number of industries dealt with by the conservation division, some of the most important lines were those the manufacturing products of which come from the steel industry or allied interests.

Chief in importance was the agricultural implement industry. The sweeping reductions ordered made in the number of sizes and types of products in this line was remarkable. The number of sizes and types of steel plows was reduced from 312 to 76; of planters and drills, from 784 to 29; of disc harrows, from 589 to 38; of buggy wheels, from 232 to 4; of buggy axles, from more than 100 to 1; of buggy springs, from more than 120 to 1; of spring wagon springs, from 25 to 2; of buggy shafts, from 36 to 1. Altogether the number of types and sizes of tillage implements eliminated exceeded 2000, leaving about 600 remaining. In the implement line alone, there has been required a great variety of sizes and shapes whose production by the steel mills necessitated a large number of rolls. These latter had to be changed frequently to meet the different specifications. This meant to the steel mills the loss of much time in making the changes, as well as the tying up of capital in equipment to make possible the varied production, and a big financial outlay for labor.

In the case of trace chains, the varieties were cut from 504 to 172. The number of basic patterns of pocket knives was reduced from 330 to 45 and the catalog numbers were cut down from nearly 6000 to 100.

After the conservation knife had been applied to the manufacture of metal beds, one producer reported that he was able to turn out 90 per cent of his normal output with 75 per cent of his normal supply of labor, and to save 33 1/3 per cent in steel. This example represents a fair average.

The size of tubing was standardized and the number of patterns cut to 30, whereas it had averaged from 60 to 80. By getting quantity production on the parts a further saving in material, labor and capital was affected. The assembling was simplified by reducing the number of patterns.

In the case of tin, the conservation division found an important reduction could be made through substitution and one plan called for the use of supplies for less essential materials for war purposes. Fiber containers also were suggested as a substitute in some instances. Regarding babbit metals, it was discovered that in many cases manufacturers were using babbit with a higher tin content than was necessary for their particular purposes. It also was found that solder could be used with a lower tin content than that used. Altogether the plans adopted meant a saving of at least 30 per cent of the tin used. This system of tin conservation indeed was one of the principal causes for the sharp drop of the price of this product from $1 to 63 cents per pound. When it is remembered that tin is an imported product the saving in its use is especially important. As a war measure, one of the most important factors was the saving in ship space. But as a peace measure it also will prove extremely important, if it is continued, either in part or whole, because experts report that no new ore deposits are being found while the consumption of this metal is increasing. Tin production in the past 20 years is said to have increased 65 per cent, and its largest consumer is the United States. The consumption of tin in bronze and brass in 1917, according to the war industries board, totaled 4800 tons, in babbit and bearing metals 10,800 tons and in solders, 17,000 tons. Plans completed by the conservation division up to the time the armistice was signed for the discontinuance of tin for certain kinds of containers, including those for food and tobacco, would have saved 260,000 tons of steel. Saving of tin also was brought about by a uniform reduction in the maximum weightings of silk by dyers, which has required 5000 tons annually.

The bureau of standards, in reporting to the war industries board regarding the conservation of tin, said that many specifications for bearing metals now in existence call for virgin tin (Banca or Straits). A large saving of these high grades of tin, it was pointed out, could be brought about by allowing the use of second quality pig tin in making tin-base babbitt. Detrimental impurities, it was shown, could still be limited, but lead could be allowed to a maximum of 1 per cent. This, the bureau reported, would not be harmful in any way to a tin base or lead base lining metal. No question existed, it was stated, but

that the tin content could be reduced somewhat in all bearing alloys. In a few cases, such as for airplanes, crank shaft bearings, etc., it was said it might not be feasible to reduce the tin content except by a small percentage, whereas in other cases it could be cut down considerably. Schedules for proposed reductions were named, and subsequently were put into effect.

It was shown also that there was little excuse for using a 50-50 or higher tin solder for any purpose whatever except for the appearance of the finished article.

Other schedules devised by the conservation division related to the production of woven wire field fencing, portable grain elevators, radiators, electrical heating appliances, motor picture machines, stoves, heaters, ovens, hand power cream separators, food choppers, hatchets, handled hammers, steel pens, elimination of manufacture of brass and nickel plated pens, talking machines, records and needles, caskets, coffins and burial goods, clocks and clock watches, metal furniture, iron soil pipe, road machinery, plumbing supplies, collapsible tubes, silver plated hollow ware, etc.

Simplification of needs of ship steel has been the matter of study for some time and included the question of standardizing 91 types which were being built by or under the supervision of the government. A schedule reducing the number of forms, and sections was announced by the Fleet corporation last October, which, it is said, will require 20 per cent less steel.

The plan adopted called for reduction of the number of types of boats and a reduction in the number of sizes of sections in each ship, and provided for centralized production. When the question was taken up there were more than 60 sizes and types of sections of steel required in the construction of the various kinds of ships, and it is understood that this number has been cut to about one dozen. A survey of steel stock requirements completed in October was made of the various yards building 3500 and 5000-ton cargo ships. There was such a wide variance in estimates made by the yards as to the tonnage of steel plates and shapes needed to cover the construction operations of the respective ships that experts were sent to the different plants to determine the real facts. One company building a 3500-ton cargo vessel asked for a little more than 1400 tons of steel per vessel, while another reported it needed more than 1500 tons for the same type.

Association Started Movement

So excellent were the economic results obtained from the program of conservation applied to the agricultural implement industry, that the National Implement and Vehicle association last November started a movement to continue the plan regardless of the government regulation.

Many types and sizes of product had worked themselves into the various industries in the ceaseless effort of each manufacturer to gain a temporary advantage over his competitors. These became fixtures and no manufacturer could drop them unless all of the manufacturers did. The process of conservation in reducing these types and sizes is not complete standardization. It is in fact an elimination of unnecessary duplication and the promotion of more efficient manufacturing. It does not do away with the variation of products of individual manufacturers and in no way does it deprive them of initiative. It is apparent that a maintenance of this part of the program of conservation at least would result in much good, in saving capital, labor, and material and would make manufacturers better able to compete in foreign markets especially in view of the cheaper costs and increased output.

The government at no time has sought standardization of products, but has insisted on a reduction in the types and sizes of many lines of manufacture. It was recognized that by cutting off all sources of waste which had escaped attention in the past, or if they had been given attention, were not stopped, and by reducing the superfluities and the uneconomic accumulations of years that the problem of supply in wartime must be solved. This plan of conservation was part of the vast program of industrial mobilization looking to the building up of a powerful and efficient war machine. It can be made to apply with some modifications so that it will perform just as notable a service in time of peace as it did in time of war.

The importance of conserving raw materials has not been emphasized as much as it ought to be. The fact that this is the most favored nation in the world in the possession of many of these vital resources has been one cause of the general wastefulness.

Chairman Hurley of the shipping board has laid stress on the importance of saving raw materials. Four years of waste and embargo, said Mr. Hurley, brought the world to a new appreciation of raw materials. He declared the latter not only will be a vital issue when peace is arranged, but the world will take steps to guard them and to increase production.

Both nations, the United States and Great Britain, before the war, were commercially asleep, Mr. Hurley added. He declares that it is time for Americans everywhere to be thinking of world trade from the angle of raw materials.

The line of thought expressed by Mr. Hurley fits in perfectly with the idea of conservation. Saving in costs of manufacture, of quantity of basic products used, of releasing capital that has been tied up uselessly, means a proper use of raw materials and the sale of goods manufactured from them in active competition with makers of other nations.

What Elimination Has Done in Wagon Wheels

OLD CONDITIONS

TEN wheel heights, requiring 10 lengths of tire iron. Variations of width and thickness numbered 132. Tires could be ordered square or oval edge. This gives 10 x 132 x 2 = 2640 sizes of tire iron necessary to meet all needs.

NEW CONDITIONS

FOUR wheel heights and four lengths of tire iron. New plan allows 12 variations in width and thickness. All tires now oval edge. This gives 4 x 12 = 48 sizes of tire iron to meet all needs.

This is only one of the hundreds of details in which standardization has limited the necessity for stocks of iron or steel. It also aids mills in reducing variety of sizes and the necessity for frequent changes of rolls.

Many Extensions

Completed or Started in 1918 by Leading Steel Companies

A total of 1168 by-product coke ovens was completed by Steel corporation subsidiaries during 1918, and 932 additional ovens are under construction. The Carnegie Steel Co. completed 640 ovens and has 768 additional building at that plant, together with additional by-product recovery facilities. At the Gary works of the Illinois Steel Co., 140 additional ovens were completed; at the Lorain works of the National Tube Co., 208 ovens; and at the Newburgh works of the American Steel & Wire Co., 180 ovens. At the Fairfield works of the Tennessee Coal, Iron & Railroad Co., a 154-oven plant is under construction.

New mill construction of the year included 8-inch and 10-inch bar mills and 28-inch hoop mills at the McDonald, O., plant of the Carnegie Steel Co.; the rebuilding of the billet and bar mill at the Farrell works of the Carnegie Steel Co., Sharon, Pa.; one 20-inch and one 10-inch merchant mills and a steel wheel plant at Gary, where additions to the 90-inch and the 132-inch plate mills and a tie plate department are building new bar mill and piercing mills, and equipment for the manufacture of seamless tubes at the Ellwood City, Pa., works of the National Tube Co. There is now under construction 24 tin mills at the Gary works, one tin mill at the Chester works, and one tin mill at the Cambridge works of the American Sheet & Tin Plate Co.; 45-inch blooming mill, 110-inch sheared plate mill and combination bar and structural mill at the Fairfield works of the Tennessee Coal, Iron & Railroad Co.

The Bethlehem Steel Co., at its Bethlehem plant, built in the year a 12-inch structural mill for rolling light structural shapes and flats, an ingot mold foundry, and a 2-ton electric furnace for the steel foundry, a complete projectile shop, and large extensions to the shops for the machining of guns and gun forgings. At the Steelton plant, 60 Koppers by-product coke ovens with by-product recovery equipment, new soaking pits and extension to the 44-inch mill were completed. At the Maryland plant, Sparrows Point, 240 Koppers by-product coke ovens with by-product and benzol plant, four 25-ton converters complete with mechanical gas producers; 60-inch universal plate mill, and 40-inch blooming mill, in combination with 24 and 18-inch tandem mills, were completed.

Coke Prices Remain

Washington, Dec. 30.—Coke prices for metallurgical purposes it is evident will not be terminated on Jan. 1. The fuel administration Saturday issued orders with regard to by-product coke and gas coke for domestic consumption. These new prices which in effect are lower than the present maximums, become effective Jan. 1. No time limit is placed upon these prices and it is apparent from this action that industrial coke will continue under the present schedule for some time to come.

Lackawanna Steel Elects

Charles H. McCullough Jr., as was expected, was elected president of the Lackawanna Steel Co. at the meeting of the directors of the company at New York, Dec. 26. He succeeds E. A. S. Clarke, who recently resigned to become president of the North American Steel Export Corp., the export combination of independent steel producers. The office of chairman of the board of the Lackawanna Steel Co. was created at the meeting and Moses Taylor, who has been vice president for a number of years, was elected to that post. C. R. Robinson, who has been general manager of sales, was made vice president in charge of sales and G. H. Downs, who has been general superintendent, was made vice president in charge of operations. Walter H. Dupka was made comptroller, succeeding J. W. Hesselman, who has resigned to become comptroller of the North American company. All of the changes are effective Jan. 1.

Prices Present and Past

(Yesterday, a month ago, three months ago and a year ago)

Quotations on leading products January 1, average for December, 1918, average for October, 1918, and average for January, 1918. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices Jan. 1, 1919.	Average prices Dec., 1918	Oct., 1918	Jan. 1918
Bessemer, valley del., Pittsburgh	$33.60	$36.60	$36.60	$37.25
Basic, valley del., Pittsburgh	31.40	34.40	34.40	33.95
*No. 2 Foundry, Pittsburgh	32.40	35.40	35.40	33.95
*No. 2 Foundry, Chicago, furnace	31.00	34.00	34.00	33.00
Lake Superior charcoal, Chicago	35.70	38.70	38.70	37.50
Malleable, valley	31.50	34.50	34.50	33.50
Malleable, Chicago	31.50	34.50	34.50	33.50
**Southern, No. 2, Birmingham	32.25	35.25	35.25	33.50
*Southern Ohio, No. 2, Ironton	31.00	34.00	34.00	33.00
Basic, eastern del., eastern Pa.	33.90	36.90	36.60	33.00
**No. 2X Virginia, furnace	35.00	38.00	37.50	33.50
**No. 2X, eastern del., Philadelphia	36.15	39.15	38.85	34.25
Ferromanganese, 70%, delivered	225.00	240.00	250.00	250.00
Bessemer billets, Pittsburgh	43.50	47.50	47.50	47.50
Bessemer sheet bars, Pittsburgh	47.00	51.00	51.00	51.00
Open-hearth sheet bars, Pittsburgh	47.00	51.00	51.00	51.00
Open-hearth billets, Pittsburgh	43.50	47.50	47.50	47.50
Steel bars, Pittsburgh	2.70	2.90	2.90	2.90
Steel bars, Chicago	2.97	3.17	3.17	2.90
Iron bars, Philadelphia	3.145	3.745	3.73	3.65

*1.75 to 2.25 silicon. **2.25 to 2.75 silicon.

	Prices Jan. 1 1919.	Average prices Dec., 1918	Oct., 1918	Jan. 1918
Iron bars, Cleveland	$ 3.07	$3.64	$3.64	$3.64
Iron bars, Chicago mill	2.90	3.50	3.50	3.50
Beams, Chicago	3.07	3.27	3.27	3.00
Beams, Pittsburgh	2.80	3.00	3.00	3.00
Beams, Philadelphia	3.045	3.245	3.23	3.185
Tank plates, Pittsburgh	3.00	3.25	3.25	3.25
Tank plates, Chicago	3.27	3.52	3.52	3.25
Tank plates, Philadelphia	3.245	3.495	3.48	3.435
Sheets, blk., No. 28, Pittsburgh	4.70	5.00	5.00	5.00
Sheets, blue anld., No. 10, Pittsburgh	3.90	4.25	4.25	4.25
Sheets, galv., No. 28, Pittsburgh	6.05	6.25	6.25	6.25
Wire nails, Pittsburgh	3.50	3.50	3.50	3.50
Connellsville furnace coke	6.00	6.00	6.00	6.00
Connellsville foundry coke	7.00	7.00	7.00	7.00
Heavy melting steel, Pittsburgh	26.00	27.50	29.00	30.00
Heavy melting steel, eastern Pa.	22.50	24.75	28.50	29.80
Heavy melting steel, Chicago	24.00	26.50	29.00	29.70
No. 1 wrought, eastern Pa.	33.00	33.50	34.00	35.00
No. 1 wrought, Chicago	27.50	29.85	33.50	35.00
Rerolling rails, Chicago	27.50	30.85	34.00	35.30

(FOR ADDITIONAL PRICES SEE PAGES 126 AND 128)

Tank's Development Hastened War's End

The Complete Story of How It Was Done

BY D. M. AVEY

SO long as artists shall picture the great war, just so long will they depict the r'aring, crashing tank as the symbol of allied victory. That ponderous forward waddle, inspiring and sustaining to friend, menacing and terrible to foe, is representative of the irresistible force which gathered to crush the Hun. Erricson, almost overnight, devised the "cheese-box on a raft" which successfully removed the peril of the first iron-clad. But the German general staff in 40 years of forethought failed to evolve a protection against the cross-country battleship. The tanks "treated 'em rough" to the eleventh hour of the last day's fighting.

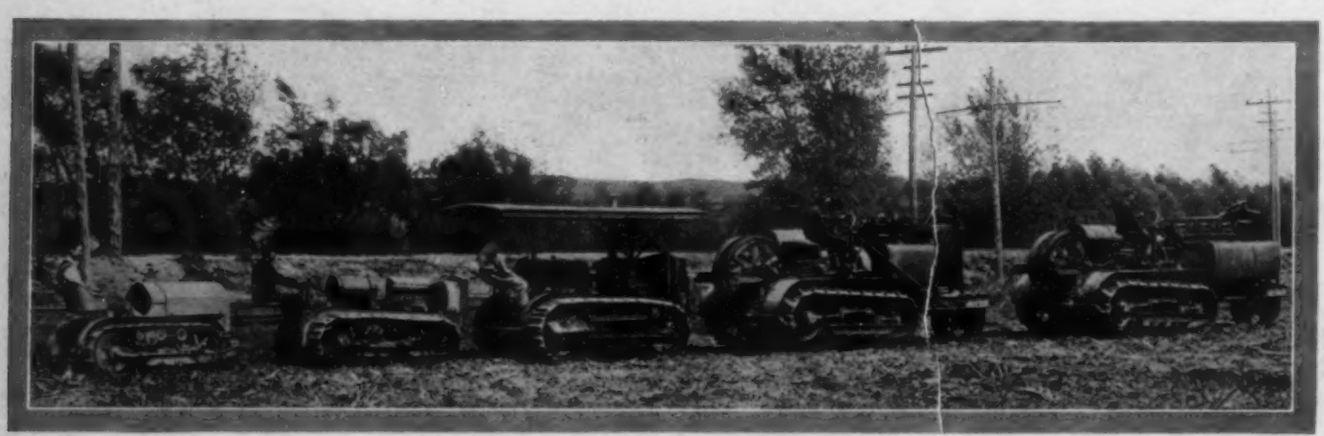
As time passes and the great forces of the war, which together brought victory, are seen in their true light, the allied nations will recognize yet more plainly the debt of gratitude which they owe to Benjamin Holt. His inventive genius evolved the engine which lays its own track. Without this one fundamental idea, the tank would have been impossible and the huge tractors which dragged the heavy guns to the front would not have been known.

In the Holt plant at Peoria, Ill., at the old plant of the same company at Stockton, Cal., in foundries, machine shops, automobile plants, structural shops and assembling establishments throughout the country, thousands of skilled workers have toiled day and night to bend Holt's invention to the task of beating the Hun. No single mechanical invention in the great war did more in a mechanical way to bring victory than did this machine designed for the uses of peace. The plowing engine metamorphosed became the juggernaut.

The marshy tule lands of the San Joaquin delta, near Stockton, Cal., brought to Benjamin Holt's mind some 15 years ago, the need of a tractor that would negotiate the spongy soil, watersoaked in swale and hummock, yet richly fertile. Mr. Holt had widened the wheels of his steam tractors until they totaled 36 feet, 18 feet on either side, and still they sank. Then he attacked the problem from a new angle. He invented the tractor which carried its own track, laid it down, rolled over it and picked it up behind and then again *ad infinitum*. The idea is not new. The builders of the pyramids no doubt applied the same principles in rolling the immense stones over the flood lands of the Nile. But Benjamin Holt was the first to substitute one practical moving force to the whole sequence of operations.

The caterpillar tractor proved to be the solution of the problem of farming soft lands. It was equally well appreciated and utilized for plowing the cane brakes of Cuba, the sugar beet patches of Hungary; for hauling supplies across the deserts, and freight in the frozen northlands; for pulling stumps in a New York reservoir, for freighting ore in the mountains. The crawl track principle turned engine power into pulling power where the bearing and traction properties of the soil were at a minimum. Foreign landowners appreciated this tractor, and machines were shipped abroad in quantity from Peoria. At this point Fate played a peculiar turn.

In Hungary these tractors were used principally on the great estates of the nobility. Invariably these same landowners were officers in the army, to whom farming was merely an avocation. The Austrians secretly had



FIVE TYPES OF PRACTICAL FARM TRACTORS WERE MODIFIED TO MEET NECESSITIES AND BECAME FIVE ARTILLERY TRACTORS ADAPTED TO VARIOUS TONNAGE HAUL. THE CATERPILLAR TRACTION PRINCIBLE FURNISHED THE INSPIRATION FOR THE TANK

constructed a number of huge Skoda howitzers, the largest siege guns known; but the problem of transporting these same monsters was unsolved.

By chance about 1911 or 1912 some of these officers witnessed the work of the caterpillar tractors in negotiating soft soil and in hauling heavy loads. From that time an increase was apparent in the tractors ordered for these large Hungarian estates. With the outbreak of the war Vienna cabled for a number of the caterpillars but the Holt factories did not furnish a single machine to the central powers. The British war department, however, placed orders for many machines and since the winter of 1914 all artillery of 6-inch size or over was hauled by the tractors built at Peoria. England bought 75 and 112-horsepower caterpillars and used them in France, in Mesopotamia, Palestine, East Africa and in fact wherever the British heavies went into action. A British army engineer, Colonel, now Major General, E. D. Swinton, heard of the work of the engine which lays its own track. One of his friends wrote him that "here is a Yankee farm tractor that can climb like hell". The work of this machine in crawling over obstacles and in traversing soft ground commended it for carrying armor protection and armament across the pits and craters of No Man's land. The armored land battleship, the invincible tank, was thus inspired.

Colonel Swinton was the famous "eye-witness" detailed to report the true facts of the war for the British press. The farm tractors used in dragging heavy guns drove home his idea of a moving land fortress. In fact in a subsequent visit to Stockton, Cal., General Swinton said that while America had contributed the machine gun to the war, it had also provided its antithesis in the farm tractor which inspired the tank. The tank was badly needed from the time of the first battle of the Marne.

It seems that for some time the Germans had been building machine guns under royalty from England but for a period before the war they made no accounting. It is undoubted that Germany had accumulated at least 50,000 of these effective weapons before the war opened. They also had a great number of trained units to handle them. The German general staff had learned the defensive value of the machine gun from the Russo-Japanese war. During the early months of the great war, in attack, in defense, and in retreat, the Huns mowed down British troops by the thousands with a murderous machine gun fire. The then known methods could not overcome them. Barbed wire and cunningly constructed defenses added to the effectiveness of the Germans' favorite arm. Artillery fire even of the heaviest became of small avail against the burrows and caverns wherein the machine guns were hidden until the fire was lifted. To launch an attack against such a system unless the latter first were literally ploughed by inches with sustained bombardment, became suicidal. It was under these conditions, on this darkened stage that the tank first lumbered its ponderous bulk to the dismay of the enemy.

The tanks were made with the greatest secrecy. It was cleverly whispered about that these structures were in reality tanks, intended for water carriers in Mesopotamia service. Tanks they were christened for purposes of secrecy and tanks they shall remain in history. Even the title when contrasted with the German name "Schutzengrabenvernitchtungsautomobil," or "Panzerkraftwagen" for short, gives a suggestion of the relative effectiveness and mobility of the machines produced for combat purposes by these two nations. The original was effective to the highest degree, the Hun's attempted improvement was innocuous.

TWO-MAN TANKS RATED AT 6-TON WEIGHT WERE PRODUCED IN QUANTITY UNDER DIRECTION OF THE ORDNANCE DEPARTMENT. ONE STRUCTURAL SHOP MET THE DEMAND BY THE INSTALLATION OF A FEW TOOLS AND HAD REACHED A PRODUCTION OF TEN TANKS PER DAY OF THIS TYPE

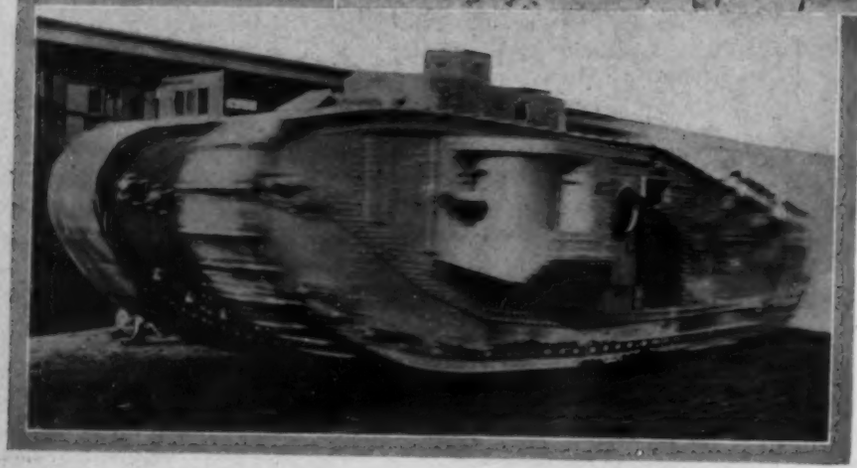
The dramatic entrance of the tanks into the war, their great and increasing activity is too well known to require comment. Frederick Palmer, war correspondent, says that they saved 20,000 lives on the Somme in the fall of 1916 alone.

Just previous to the armistice the French were building three models: the Saint-Chaumont of 23 tons, carrying eight men; the Schneider of 13 tons, manned by six; and the Renault, 6 tons, with a crew of two. Louis Renault, French automobile manufacturer, conceived the idea of the small tank and its development was due to his initiative. He considered the property of quick maneu-

HUNDREDS OF FRENCH LIGHT TANKS WITH A SINGLE RAPID FIRE OR MACHINE GUN SUPPORTED THE AMERICANS AT CHATEAU THIERRY AND SUBSEQUENT ENGAGEMENTS UP TO NOV. 11

BRITAIN'S HEAVY TANKS FROM THEIR FIRST APPEARANCE WERE INVALUABLE IN ATTACK. THEY OPERATED WITH AND WERE SUPPORTED BY BODIES OF INFANTRY

British Official Photograph



HEAVY ARMOR COUPLED WITH TREMENDOUS POWER MADE THE AMERICAN MARK VIII A FORMIDABLE FIGHTING UNIT. THIS TYPE, BUILT FOR ASSEMBLY ABROAD, IS 34 FEET IN LENGTH, CARRIES A CREW OF 12 MEN COMFORTABLY AND IS EQUIPPED WITH TWO 6-POUNDER, SIX MACHINE GUNS AND A COMPLETE WIRELESS OUTFIT

BABY TANKS RATED AT 3 TONS CARRYING A CREW OF TWO MEN, WERE DEVELOPED TO SERVE THE PURPOSE OF MACHINE GUN CAVALRY. ORDERS FOR 15,000 OF THESE WERE PLACED

British Official Photographs

WHIPPET TANKS DEVELOPED BY THE BRITISH, FILLED A NEED WHICH THE HEAVIER, SLOWER MOVING MONSTERS, FIRST USED, DID NOT MEET. THEY WERE OF INESTIMABLE SERVICE IN THE RAPID ADVANCES MADE BEHIND THE GREAT GERMAN RETREAT WHICH WAS TAKING PLACE JUST PREVIOUS TO THE SIGNING OF THE ARMISTICE

vering to be the most desired, and when his government failed to be interested, he built 100 of the first "baby" tanks at his own expense. Production of this type reached 850 a month in France just before the cessation of hostilities.

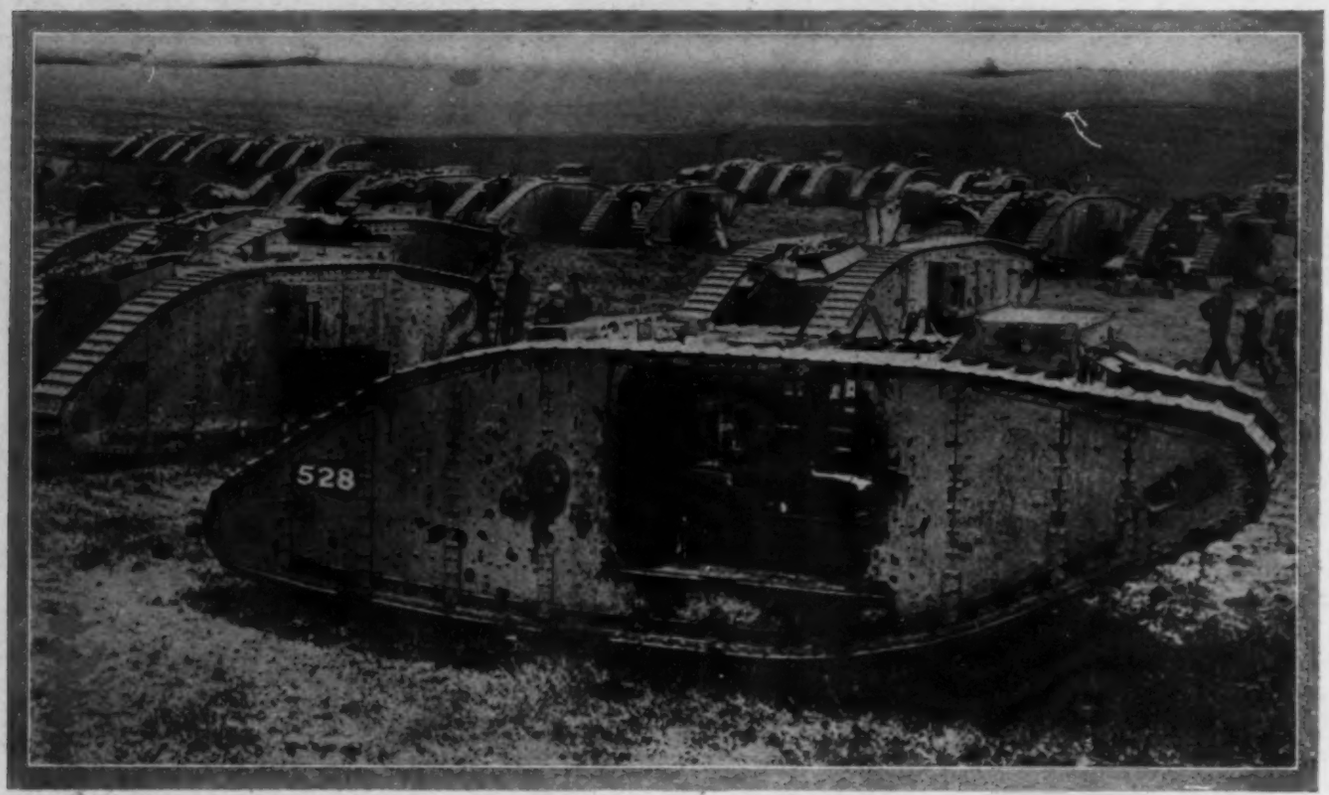
Germany appreciated the value of the tanks. She flattered the British to the extent of imitating the invention but in the usual *kolossal* fashion. The traveling belt which drove the British tanks was deemed a vulnerable point by the Germans. With that same thoroughness which led them to design the trench helmet which would cover the back of their necks, the Germans put a sort of apron or skirt of armor all about their tanks, and covered the caterpillar tracks well down to the ground. The result was satisfactory with smooth going, but when the rough terrain at the front was encountered, the aprons, like the front of snow-plows, dug into the earth and stalled them.

That same love for the "super" attributes made the German tanks unwieldy. Their first efforts were over 45 tons in weight due to 1.2-inch armor in the front, 0.8-inch in the rear and 0.64-inch on the sides and top. Even the bottom was protected with steel plates and in this mass of armor plate was housed a heavy motor, two small rapid fire guns, six machine guns, ammunition, supplies and finally 18 men. The interior arrangement of this poorly designed machine and the great number of men carried made it necessary to put in straps from which the crew hung in a manner familiar to all metropolitan street car riders. Other and better designs were made by the Germans, but not in quantity.

General Pershing's judgment was the impelling force which put pressure behind the production of American tanks. Two engagements over similar terrain, and under parallel conditions of attack and defense showed clearly the life-saving value of the tank. The machine gun organization of the Germans was most effective in both instances. In one attack, the allies suffered 1800 casualties of which over 800 were deaths under fire from Hun machine guns. In the second instance a number of tanks were used with the result of only 700 casualties of which less than 200 were deaths. The shortened period of German resistance and the quick work of the tanks in wiping out machine gun emplacements in these as in many previous engagements proved the fact that America must have tanks, in quantity and at once. About Aug. 1, Pershing cabled his urgent need in this direction.

The result was an organization as comprehensive as that which was set up for the production of ships under the Emergency Fleet corporation. This organization was made directly responsible to the chief of ordnance, but was interlocked with the ordnance department only at its source. L. J. Horowitz, president of the Thompson-Starrett Co., New York, construction engineers, was chosen as the head of tank production and under him were six executive assistants handling the problems of administration, production, engineering and priority. The necessity for this priority representative was at once apparent as ordnance material in many instances took a lower rating than, for example, ships and airplane work. Under these executives were department heads dealing with estimates, procurement, engineering, production, supply, traffic and employment. These formed the Washington end of the organization.

The field staff was cut to fit the existing ordnance offices, which had been built up along territorial lines into a number of divisions. These divisions were represented in central offices located in the districts where work was being carried on. A field manager was appointed in each of these divisions to handle production and personally to supervise the work on tanks within the district. A con-



TANKDROME IS THE APPELLATION GIVEN TO THE HUGE CONCENTRATIONS OF TANKS ASSEMBLED BY THE BRITISH AT STRATEGIC POINTS ALONG THE WESTERN FRONT. HUNDREDS OF THESE LAND BATTLESHIPS WERE USED AT TIMES TO GRIND THROUGH ACRES OF WIRE AND SIT UPON WASPISH MACHINE GUN NESTS

FROM THE FIRST WHEN A MODIFIED FARM TRACTOR HAULED FIELD ARTILLERY INTO MEXICO, THROUGH LATER SUCCESSFUL FIELD TESTS WITH SPECIAL TYPES, TO THE PRESENT UNIT IN WHICH THE GUN IS MOUNTED ON ITS OWN CATERPILLAR TRACK, HAS OCCUPIED ONLY A FEW YEARS. PLINY E. HOLT AND COL. J. B. DILLARD WERE THE DESIGNERS OF THE 8-INCH SELF-PROPELLING HOWITZER SHOWN

crete instance will serve to explain the manner in which the work was handled.

In the ordnance district, with headquarters in Cleveland, Capt. A. C. Webb, a man who had been engaged in automobile manufacture practically since its inception and who was serving the department by following truck production, was chosen field assembly manager. His work included reports on plants which were equipped to produce tanks, or any of the materials needed for their production; the expediting of manufacture through a system of progress reports from each plant and the following up of all shipments and arrivals of material, plain and fabricated. In each plant handling tank work was a production expediter who reported personally on the work in his shop. Field assistant managers in the main assembly shops followed the progress of the work at every stage. In this manner if the Van Dorn Iron Co., Cleveland, found that its stock of link pins for the caterpillar tracks were short, a communication to the expediter in the plant which was producing these pins brought an immediate reply. If the expediter reported any delay due to a failure to secure steel, the field assembly manager through Washington immediately secured the allocation of the raw material required. The power of the organization to secure results lay in personal contact and in the delegation of authority to those directly on the ground. Production was getting under way on the 6-ton type, the parts for the Mark VII were being made in quantity and a large output would have been assured on the 3-ton within a short period when the armistice was signed. In fact by Jan. 1 a total output of 200 tanks per day would have been reached in the United States.

The Mark VII, similar in many ways to the British large tank, weighs 35 tons and carries a crew of 11 men, each a specialist in his assigned work. This tank was designed by British and American engineers in London under specifications laid down by the British general staff. It is equipped with a 400-horsepower Liberty motor driving the crawler sprockets through two great drive chains. The enormous power developed by this tank may be appreciated from the fact that each link of the chain which resembles the familiar bicycle type, is tested to 150,000 pounds tension. The two side bars to each link are connected by two 2-inch diameter steel pins. A com-

British Official Photograph

BRITISH "BIG FELLOWS" ACCOMPANYING PATROLS WERE EFFECTIVE IN CLEANING UP CAPTURED VILLAGES WITH A MINIMUM OF CASUALTIES. CLIMBING POWER DEMONSTRATED FIRST IN THE FARM TRACTOR, WAS OF SERVICE IN DEMOLISHING POSSIBLE ENEMY COVER, FURNISHED BY WRECKED BUILDINGS

WINCHES ON THE BACK OF AMERICAN ARTILLERY TRACTORS ARE OF SERVICE IN HAULING GUNS AND SUPPLY TRAINS OUT OF DIFFICULTIES

plete link weighs between 20 and 25 pounds. These enormous chains and the drive gears effect a gear reduction of almost 100 to one between the 400-horsepower motor and the sprocket shaft. It will be understood readily why the Mark VIII can lean against a 3-foot brick wall, walk easily through it and carry away the debris on its broad back. The first of these mobile forts was built and assembled by the Locomobile Co., Bridgeport, Conn., and after suitable tests had been made, production was commenced upon the parts in a number of plants. These were to be assembled in France with British-made armor and guns.

The second order under consideration was to have been placed entirely in America but the armistice intervened. The armament of the Mark VIII includes two 6-pounders mounted back of swinging turret-like plates at each side, and seven Browning or Hotchkiss machine guns.

The whippet or 3-ton tanks had been ordered in quantity, but production had not yet been reached. This tank is manned by a gunner and a driver and is equipped with a single Browning machine gun. A Ford passenger type motor furnishes the power for the whippet and propells it at about 8 miles per hour over the roughest ground. The 6-ton American tank follows closely the principles of the French Renault. It also is a two-man tank, with a single machine gun mounted in a revolving turret supported on a ball race. The gunner stands erect, held by lashings to lessen the shock sustained in the progress over rough ground. The driver sits forward and both gunner and driver are amply protected from hostile fire by ¼ to ½-inch armor on all sides and beneath.

About six out of seven of the first American 6-ton tanks in service were

Tank Program in Progress in October, 1918

TYPE	NUMBER ORDERED	TYPE OF GUN	REMARKS
Six-ton Special Model 1917	4440 Maxwell Motor Co., Dayton, O. Best Foundry Co., Bedford, O. Van Dorn Iron Wks., Cleveland.	Marlin or Browning machine gun or 37 m. m. field type gun	These are the Americanized Renault with Buda or Hudson motor and all other parts duplicate of Renault tank.
Six-ton special Mark II. Alden design	1000 Hudson Motor Car Co., Detroit	Marlin or Browning machine gun or 37 m. m. Puteaux field type gun	These are the Renault with Hudson motor, transmission fans and clutches. Otherwise duplicates of Americanized Renault.
Mark I.	1000 Ford Motor Co., Detroit	One Browning and one 37 m. m. Puteaux	This is the new combination 3-ton and 6-ton, 3-man tank with two guns. Hudson engine, Ford tractor transmissions and worm drives.
3-Ton	15,000 Ford Motor Co., Detroit	One Browning machine gun	This is the small machine 2-men, one gun. Two passenger car Ford engine and transmission and truck worm drive.
Mark VIII A. A.	1500	7 Hotchkiss machine guns, and two 6-pounders	This is the Anglo-American program of component parts England furnishes armor plate and guns. Assembly to be at Chateau Boux. France.
Mark VIII U. S.	1450	7 Browning machine guns, and two 6-pounders	These to be made complete in the U. S. except 6-pounders.

FIVE MINUTES SUFFICE THE 6-TON TANK TO CRAWL UPON ITS RUBBER TIRED TRAILER, WHEN IT IS WHISKED TO A VANTAGE POINT BY A SPECIAL FOUR-WHEEL DRIVE TRUCK. STORAGE SPACE FOR 30 GALLONS OF GAS GIVE IT A CRUISING RADIUS OF OVER 100 MILES FROM THIS BASE

put out of commission by shots through the breast or bottom of the tank as it reared over some obstruction. Experience taught the necessity for protection below as well as on the sides and top.

Motor trucks with trailers marvelously increase the range of operation of the lighter tanks. America built a great number of 10-ton trailers upon which the 6-ton or 3-ton tanks could mount under their own power and be carried to the nearest point consistent with safety to the trucks. The tanks then "went ashore" and crawled into action, returning to their trucks as operating bases, when the job was finished. Similar trailers and motor trucks were extensively used for transporting field guns under service conditions. Only the heavier artillery and the large sized tanks offered difficult transportation problems to the army engineers.

Profiting by the experience of the allies, the United States went into the war with a motorized artillery program on a scale that set nearly a hundred plants at work making Holt type tractors and parts and in assembling them.

As early as 1911 an American army officer had visited the Holt plant at Peoria to inspect the caterpillar type of tractor. It was not until May, 1915, however, that the first army test of tractors was arranged at the Rock Island arsenal. Competing tractor and truck manufacturers were obliged to bear the cost of the demonstration; a fact which furnishes a significant sidelight on the preparedness sentiment of that period.

This demonstration dealt with purely commercial types of trucks and tractors, but the report of the tests in the *Field Artillery Journal* estimated that the saving by motorization of a 4.7 or 6-inch battery would amount to $36,000 in first cost and $30,000 a year in maintenance. This took no account of the saving in personnel of 63 men per battery; the economy in shipping space with machines and fuel compared to horses and forage; nor the gains in speed, and endurance on the march.

After a series of tests, three 45-horsepower tractors with slight changes for army convenience were shipped to Hawaii early in 1916, and later in the same year 27 more of the same type followed. This battery, the Ninth Field Artillery stationed at Honolulu, became the first completely motorized artillery regiment in the world with American-built power units. Its equipment, besides the tractors, included motor trucks and motorcycles.

Modified Holt model tractors known as the 10 and 15-ton artillery types were next adapted to the smaller guns. P. E. Holt, Wm. Turnbull and E. F. Norelius of the Holt organization, co-operating with the ordnance officers, developed the 5 and 2½-ton artillery tractors. These were armored, geared to road speeds of 12 to 15 miles per hour and furnished with special accessories. The smaller models were built chiefly in outside plants, while the Holt plants specialized on the 10, 15 and 20-ton models. At the close of the war, practically 25,000 tractors were under contract to replace about 640,000 artillery horses.

FROM WAR TO PEACE IS A SHORT CRAWL FOR THE CATERPILLAR. ITS USE WITH A SPECIAL LAND LEVELER IS RECOMMENDED FOR SMOOTHING THE TRENCHES AND SHELL HOLES OF THE DEVASTATED REGIONS IN FRANCE AND BELGIUM

Steel Capacity is 50,000,000 Tons

American Facilities for Steelmaking Are 48 Per Cent of World's Total—Expansion Last Year Showed Comparative Decline and Fewer Melting Units Are Now Being Built—Pig Iron Capacity is 44,000,000 Tons

BY R. V. SAWHILL

UNSUNG victories of the great war will continue to be sung for months. The rapid removal of the cloak of secrecy, which has hid many of America's war activities, is unfolding daily new stories of old accomplishments—governmental, industrial and individual. Scientific progress has made modern warfare so complex that difficulty is found in properly balancing the credit between individual factors. It is easy to believe that the war would not have been won but for the influence of a particular factor and difficult to deny that another element probably was equally as powerful in its success-bringing effect. Credit for winning the war thus runs all the way from the resilience of the martial spirit of France as revealed at the first Marne or the immediate mobilization of the British grand fleet, down to the individual acts of one man or the increased production of one product or material. Fortunately the credit for winning the war is a matter of small account—the thoroughness of the victory affording ample elbow room for as many claimants as have yet appeared.

Little dispute can be raised against any statement advanced in favor of the great part played by the steel industry. Modern hostilities are so essentially contests between metals and machines—as well as men—that a record of the metallurgical progress during a war is certain to disclose the side to which victory ultimately came.

One phase only of such advancement, additions to steel producing capacity, tells much of the story of how success was won in this great war of German aggression. In this increase American steel producers played a part which gained importance during the show (as the soldiers called it) and finally dominated the last act.

On Jan. 1, 1914, the ingot producing capacity of the United States was estimated by THE IRON TRADE REVIEW as 37,000,000 tons. On Jan. 1, 1919, the capacity is placed at 50,500,000 tons. This 5-year increase of 13,500,000 tons or 36 per cent is a measure of the powerful and sustained response given by the country's great industry to the needs of civilization. The first year brought an increase of 500,000 tons; 1915 witnessed a gain of 1,500,000 tons; 1916, a further growth of 4,000,000 tons; 1917 a gain of 5,500,000 tons and the year just ended, a further increase of 2,000,000 tons.

These increases in American capacity for producing steel ingots thus followed closely the ascending demands brought on by the constantly expanding operations on the various battlefields. The drop in new capacity shown in 1918 from the high total set in 1917, reflects broadly the security of the steel supply position attained by the allies.

During this period of tremendous American expansion, Germany's steel producing capacity remained almost unchanged. The summary presented on page 25 shows that the only notable increase in German capacity resulted from the seizure of steel plants in invaded lands. The increase in the United States during the war years was 67.5 per cent of the total German capacity, which is placed at 20,000,000 tons.

Allied and neutral nations during the same period added 8,450,000 gross tons to their capacity, or about 63 per cent of the American gains. The United States at the opening of the war was in a position to produce about 44 per cent of the world's total. At the present time, American steel plants could turn out 48.5 per cent. Prospects for large additions to steel producing capacity in this country during the new year are less bright than at any time during the last six years. At the present time, 12 open-hearth furnaces are under construction, their rated annual capacity being 1,005,000 gross tons. A year ago, new projects under way promised the addition of 1,530,000 gross tons to the country's steel producing capacity, 27 furnaces being involved in the construction program. Two years ago at the opening of 1917, 95 furnaces with a rated capacity of 4,795,500 gross tons were being built. At the opening of 1916, 74 open-hearth furnaces having a capacity of 3,755,000 gross tons were under construction. On Jan. 1, 1915, the figures were 43 furnaces of 1,760,000 gross tons, while at the opening of 1914, 40 open-hearth furnaces, having a rated capacity of 1,830,000 gross tons were being built.

The decline in promised additions is a natural aftermath to the heavy construction work carried on during the past few years. As a result of this expansion, the steel industry faced a condition where semifinishing capacity threatened to outstrip the facilities for producing both raw materials and finished products. Pig iron capacity

Open Hearths Completed During 1918

	No. of furnaces	Rated capacity, tons	Estd. annual production, tons
Canton Sheet Steel Co., Canton, O.	2	90	130,000
Central Iron & Steel Co., Harrisburg, Pa.	1	100	70,000
Crucible Steel Co. of America, Pittsburgh	4	50	140,000
Erie Forge & Steel Co., Erie, Pa.	2	35	55,000
Follansbee Bros. Co., Follansbee, W. Va.	1	40	30,000
Indiana Steel Co., Gary, Ind.	2	200	340,000
Lukens Steel Co., Coatesville, Pa.	6	100	420,000
Pittsburgh Crucible Steel Co., Midland, Pa.	2	60	80,000
Republic Iron & Steel Co., Youngstown, O.	2	80	110,000
Tacony Ordnance Corp., Philadelphia, Pa.	2	40	60,000
Findel-Morris Co., Eddystone, Pa.	1	45	32,500
Trumbull Steel Co., Warren, O.	7	100	490,000
Sharon Steel Hoop Co., Lowellville, O.	2	75	100,000
Steel & Tube Co. of America, Indiana Harbor, Ind.	4	75	200,000
Utah Iron & Steel Co., Midvale, Utah	1	50	35,000
Totals	39		2,192,500

Open Hearths Building at End of 1917

	No. of furnaces	Rated capacity, tons	Estd. annual production, tons
Bethlehem Steel Co., Sparrows Point, Md.	4	200	480,000
Central Iron & Steel Co., Harrisburg, Pa.	1	100	70,000
Lukens Steel Co., Coatesville, Pa.	2	100	140,000
McKinney Steel Co., Cleveland, O.	2	75	100,000
Pacific Coast Steel Co., Seattle	1	40	30,000
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.	1	200	120,000
Worth Steel Co., Claymont, Del.	1	90	65,000
Totals	12		1,005,000

in particular has not grown in exact proportion to the increase in steelmaking facilities. At the present time, the United States is in a splendid position to meet any demand for semi-finished materials which may develop either from domestic sources of demand, or from the growing foreign trade.

The accompanying table shows in detail, by companies and furnaces, the growth in steel ingot producing capacity in 1918. The number of furnaces built last year was 39, with an estimated annual capacity of 2,192,500 gross tons.

In 1917, which year witnessed the greatest expansion in steel producing capacity on record, 101 furnaces with a capacity of 5,413,000 gross tons, were built. Additions during that year thus averaged close to one-half million tons monthly. The previous year marked the opening of the 2-year period of greatest expansion, as during 1916, furnaces to the number of 105 were built, these having a capacity of 4,300,000 gross tons. In 1915, new furnace additions totaled 43 with a capacity of 1,759,000 gross tons. In 1914 only nine furnaces with a capacity of 747,000 gross tons were built, while in 1913, new construction comprised 62 furnaces of 3,120,000 tons annual capacity.

Huge Capacity Available

The estimate of 50,500,000 tons as the country's steel producing capacity at the present time, runs well above the actual figure for 1918 output. The discrepancy, however, is readily accounted for by the disturbing conditions under which the industry operated. In a period more closely approaching normality, there is no reason to question the country's ability to produce 50,000,000 tons of steel in a year. Given such conditions when labor and transportation is more abundant and adequacy of raw materials guaranteed, American steel plants could produce more than twice as much steel as they made in either 1909, 1911, or 1914. They could turn out a tonnage equal to the output of the world in 1914.

Pig iron producing capacity built during 1918 also decreased from the 1917 total, although the decline was proportionately less than in the case of open-hearth furnace construction. During the year just ended nine new blast furnaces were blown in, these having an annual capacity of 1,425,000 tons. In 1917 a new record was made in additions to pig iron producing capacity, 14 furnaces being constructed. These new stacks had an annual capacity of 2,182,500 tons. In 1916 and 1915, new blast furnace capacity of only 530,000 tons was built in each year.

The following table shows the capacities of the new blast furnaces blown in each year from 1905 to 1918:

Year.	Gross Tons.
1918	1,425,000
1917	2,182,500
1916	530,000
1915	530,000
1914	None
1913	550,000
1912	1,000,000
1911	565,000
1910	1,794,000
1909	1,930,000
1908	1,188,000
1907	2,065,000
1906	1,135,000
1905	1,292,000

On Jan. 1, 1919, the country's estimated pig iron producing capacity is 44,000,000 tons. At the opening of 1918, the estimated capacity was set at 42,500,000 and in 1917 at about 40,000,000 tons. Thus, the growth during the past two years was 4,000,000 tons or 10 per cent. Actual pig iron production in 1918 was about 38,600,000 tons against 38,621,216 tons in 1917. In 1916 the actual production was about 39,400,000 tons. The gap between estimated capacity at the present time and actual output during the past 12 months reflects the unsettled conditions prevailing last winter and throughout the year. In January, 1918, for instance, production of coke and anthracite pig iron was only 2,403,227 gross tons, while in October, a month of the same length, the output had jumped to 3,482,392 gross tons. In the last six months of 1918, production of this class of pig iron totaled about 20,425,000 tons, or at the rate of close to 41,000,000 tons per annum. Estimates of pig iron producing capacity take into consideration, of course, only those furnaces available for operation at the present time.

The new furnaces completed in 1918 were: One, Iroquois, Iroquois Iron Co., South Chicago, Ill.; two Lackawanna, Lackawanna Steel Co., Buffalo; two Gary, Indiana Steel Co., Gary, Ind.; one Indiana Harbor, Steel & Tube Co. of America, Indiana Harbor, Ind.; one Steelton, Bethlehem Steel Co., Steelton, Pa.; one Temple, Seaboard Steel & Manganese Co., Temple, Pa., and one Jeanette, Brier Hill Steel Co., Youngstown, O. All but one of these stacks are rated at from 500 to 600 tons per day.

At the opening of 1919 construction had been started on 12 furnaces, these having an estimated annual capacity of 1,975,000 tons. A year ago 36 furnaces with an estimated annual capacity of 5,415,000 tons had been started or authorized. At the opening of 1917, 21 blast furnaces were being built. The furnaces now under construction include: Four, National Tube Co., Gary, Ind.; two, Ford Motor Co., Detroit; one, Weirton Steel Co., Weirton, W. Va.; one, Pittsburgh Crucible Steel Co., Midland, Pa.; two, Bethlehem Steel Co., Sparrows Point, Md.; one, Alan Wood Iron & Steel Co., Swedeland, Pa., and one, Bethlehem Steel Co., Steelton, Pa. In addition, authorization was given some months ago for various furnace groups, work on which has not been started, and which are not included in the above list. These include five stacks for the Bethlehem Steel Co. at South Bethlehem, Pa.; two at the company's Sparrows Point plant, and two at the Minnesota Steel Co., Duluth.

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HUMAN RECONSTRUCTION RECLAIMS

LIEUTENANT AVERY saw action at Chateau Thierry. Zero hour had arrived. The members of his platoon with the others, had left their dugouts to go up the hill and over the top. His superior officers had fallen as, after descending the other side, they faced the meadow at the base of the hill and he had assumed command. Over this grain field came the gruelling machine gun fire of the Germans from their protected positions in the woods. A piece of shrapnel came singing and whizzing its way, to find a lodging place in the lieutenant's cheek, tearing an ugly gaping hole. He bled profusely, but opened his first aid kit and broke the capsule of iodine into the wound, which made it sting unbearably. With the cry: "Up and at 'em boys and give 'em hell," he rallied his men for a dash at the hidden Germans. Suddenly he found himself on the ground, which was being stained red from a machine gun bullet wound in his shoulder. He roused himself from his stunned condition and by force of will power alone led his men onward after the now fleeing and routed Boche. Almost without warning came a high explosive shell out of the blue and this time Avery's right arm was shattered. Weak from loss of blood, he crawled into a shell crater and more faintly each time he gave the order, he cried: "Forward men! Forward to victory!" Unconsciousness at last gave him relief from his agony.

After the 2-hour battle, which resulted in a signal yet costly victory for the American forces and which made another page in American history, Lieutenant Avery was found by the stretcher bearers and given immediate first aid. An ambulance carried him to a field dressing station, where he was given the antitetanus inoculation, which practically is the first thing done for the wounded. After his wounds were dressed more thoroughly, he was transferred to a casualty clearing station and thence to a base hospital. At the base hospital, he was given the now justly famous Dakin-Carrell treatment, with which iron and steel men now largely are familiar. Despite the fact that thousands upon thousands of amputations have been avoided by the adoption of this method of irrigating wounds, it was found necessary to amputate Avery's arm above the elbow. As he came out from under the influence of the anesthetic, he found General Bundy at his bedside and after the general had shaken his left hand, Avery pointed to the stub of his right arm and said: "General, I'll not need any *croix de guerre* to show I've been over the top, will I?" "No," the general replied, "but I want to tell you that the *croix de guerre,* the distinguished service medal and other marks of recognition of your wonderful courage in action are to be yours. *Captain* Avery, I congratulate you."

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ARTIFICIAL ARMS OR LEGS EQUIPPED WITH MUSCLES OF STEEL AND TENDONS OF LEATHER PERMIT A MAN TO OVERCOME THE FEARFUL HANDICAP OF MISSING LIMBS

After a period of care, he was taken to the American general hospital in Paris. His stay there was short. A transport two weeks later, docked at an Atlantic port on this side and from a distributing hospital Captain Avery was taken to the Walter Reed general hospital. This hospital is located on a hill overlooking the capital. He was within

WAR'S DISABLED FOR INDUSTRY

By W.H.Lloyd

sight of the building in which Secretary Baker not many months before had drawn the capsule which drafted the first American boys into the national army.

In his hospital experience, Avery had become acquainted with the methods devised to prevent despair and inspire ambition. He had been given the will to live and overcome the handicap of the missing arm. Due to clever surgery, his other wounds had so healed, their marks were hardly visible. He had become dexterous in the use of his left hand as well as the artificial arm, an intricate contrivance of steel muscles and leather tendons and he was introduced to the workings of the federal board for vocational education. Bedside and ward occupation as well as hospital shop activity, designed to prevent idleness, all had future vocational reeducation in view.

Now instead of a discharge from the army followed by a life of dependence upon others, he elected to take advantage of the government's offer to rehabilitate him so that he could take a much better place in industry than the one he occupied prior to going to the officers' training school at Fort Benjamin Harrison. Instead of being an unimportant clerk in an office, he chose to be taught the art of oxy-acetylene welding. Like many others, he found the complicated artificial arm all right for dress-up purposes, but unhandy for working needs. Another arm, less elaborate than the other but more practical, was furnished him. In its end could be fitted at will a hook or a clamp or clutch, with which he could more easily hold working tools. The vocational advisor in the hospital had explained to him the possibilities of oxy-acetylene welding as a trade. He was told how it was only in its incipiency, that he could rest assured such work would be plentiful at all times and wages always would be high. He was sent to the Red Cross Institute for Crippled and Disabled Men in New York, where he was taught the use of the oxy-acetylene welding torch until he was ready for the job obtained for him through the federal board for vocational education, co-operating with the war department committee on education and special training and its division of physical reconstruction.

Avery is real in that he is representative. For several months

A Message to Every Disabled Soldier

From Surgeon General William C. Gorgas, United States Army

MORE than chevrons, bars, or insignia, the marks of battle which you bear, sacred symbols of your service to a high cause, have given you a rank among your fellows. That rank makes you forever one of those to whom the nation shall always look for future sacrifices as noble as those you have already made and for future achievements worthy of your past.

No matter what has befallen you, you are still a soldier. Although you have returned from the front you have to fight foes more worthy of your steel than the Germans, discouragement, loss of ambition, readiness to accept the easiest way, reluctance to play your part in the peace world. We know you will conquer these enemies.

Your country needs you yet to fight the battles of peace.

You are still one of the world's workers. In spite of your handicap you can produce with hand or with brain just as much as the next man. Your country needs soldiers in the great army of workers.

You will not have to go it alone. The government and the Red Cross will see you through. The government will restore to you the use of injured members, it will teach you a trade, it will give you an opportunity to earn your living as before, perhaps better than you did before. And all along the line the Red Cross will be with you and your family.

We have pledged our faith in you. We are for you and with you always.

OXY-ACETYLENE WELDING AS TAUGHT GREAT BRITAIN'S SOLDIERS AT WINNIPEG, MAN., AND AT SHEPHERD'S BUSH, ENG., (SEE LOWER LEFT HAND ILLUSTRATION) IS A COURSE OPEN TO AMERICAN SOLDIERS AT THE RED CROSS INSTITUTE FOR THE CRIPPLED AND DISABLED

casuals have been arriving in this country from overseas. Since the memorable date in history, Nov. 11, 1918, when the armistice was signed by beaten Germany, these wounded men have debarked in increasing numbers. In one week recently 3572 were landed in this country and sent to the various hosiptals which had been equipped to receive them.

Nineteen Reconstruction Hospitals

In addition to the Walter Reed general hospital in Tacoma park, Washington, already mentioned, 18 other hospitals are engaged in the rehabilitation of these men. Nine of them are general hospitals as follows: No. 2, Fort McHenry, Md.; No. 3, Colonia, N. J.; No. 6, Fort McPherson, Ga.; No. 10, Boston; No. 26, Fort Des Moines, Ia.; No. 28, Fort Sheridan, Ill.; No. 36, the Ford hospital, Detroit; the Letterman hospital, San Francisco, and the base hospital at Fort Sam Houston, Tex. Two United States general hospitals, Nos. 30 and 31, for neurosis patients or victims of shell shock, are located at Plattsburg Barracks, N. Y., and at Carlisle, Pa., respectively. Tuberculosis hospitals, numbers 8, 16, 19, 20, 21 and 29, are located as follows: Otisville, N. Y.; New Haven, Conn.; Azalea, N. C.; Whipple Barracks, Ariz.; Denver and Fort Snelling, Minn. The base hospital at Fort Bayard, N. M., is also utilized for consumptives who have come back from the war and are coming back in ever increasing numbers. Before the conflict ended, a large number returned from German prison camps with the disease in advanced stages and were sent to Denver and other points in the west, where an effort is being made to arrest the ravages of their sickness.

LEG AMPUTATIONS DO NOT PREVENT WORK AT A LATHE

Photographs by courtesy of American Red Cross

In addition, convalescent hospitals are being operated in the various cantonments and to these are being sent the boys whose homes are in neighboring sections.

Many Wounded in New York

One of the largest hospital institutions of its kind in the world is the new Debarkation hospital in New York City. On each of the four floors of the the large building which formerly housed the department store of Siegel-Cooper Co., and the establishment of J. B. Greenhut, are found 1000 beds. A large percentage of the total of 4000 is filled with wounded recently returned from France and other battlefronts. Two floors are devoted to surgical work.

Termination of the conflict came just

Courtesy of American Red Cross

HANDICAPPED BY THE LOSS OF ONE ARM, OPERATOR IS SHOWN CUTTING OUT FOUNTAIN PENS ON A DROP PRESS

when plans were being perfected for additional hospital accommodations. Many of the government's efforts were curtailed. Typical of this is the case of Cleveland. Arrangements had been made to take over a clothing factory offered by Richman Bros., which was to have housed approximately 4000 soldiers. The company was to be paid a rental of $1 a year and was to obtain the use of the quarters occupied by the Willys-Overland Co. The latter company likewise was to receive $1 a year rental and was to occupy the building formerly used by the Neighbors Motor Car Co. For it the Cleveland mayor's war board would have paid $15,000 a year. As the soldiers' health improved, they were to be transferred to a convalescent home, formerly the Rhodes home in Lakewood park on Lake Erie or to a section of Nela park, the headquarters of the National Lamp Works of the General Electric Co., which was to be converted into a summer tent colony. C. A. Grasselli, president of the Grasselli Chemical Co., Cleveland, donated his home for a retreat for blind soldiers.

Efforts Are Combined

Early last November, the Cleveland Association for the Crippled and Disabled and the Sunbeam association, combined their organizations under the name of the former and the charter of the latter. A survey developed the fact that not counting the returning soldiers, Cleveland had 4186 cripples, 65 per cent of whom never had benefited by any charitable organization and the combination was effected because the work of their reclamation was too much for either society individually. Dr. Minot O. Simons, head of the association for the crippled and disabled, said: "Our new organization will prepare to carry out in Cleveland the government's program for placing each individual soldier who has been crippled into the industrial niche that fits him."

Many Plans Have Been Laid

Other communities likewise have made plans for the returned disabled soldiers and sailors. Last October, the New York German club's name was changed to the Lafayette Home for Convalescent Soldiers and Sailors to the strains of "The Star Spangled Banner." In Chicago, the $7,000,000 Field Museum of Natural History in Grant Park was offered to the government and only the cessation of hostilities prevented its acceptance.

Courtesy of American Red Cross.

ONE-ARMED MEN OPERATE DRILL PRESSES

At West Baden, Ind., a few hundred American soldiers are convalescing at the West Baden hotel, which was taken over and remodeled by the government for a general hospital No. 35 at an annual rental of $150,000. It will accommodate 1500. Fully equipped operating rooms are located on the sixth floor. Manual training is to be taught in two new buildings to be constructed.

At Walter Reed general hospital, 18 complete courses are offered for the rehabilitation of sailors and soldiers. The hospital comprises 74 buildings and 10 more are in course of construction.

Published by and for the soldier-

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RETURNED AMERICAN SOLDIERS AT UNITED STATES GENERAL HOSPITAL NO. 9, LAKEWOOD, N. J., FORM A CLASS IN AUTOMOBILE MECHANICS. MANY OTHER COURSES ARE OFFERED

patients who are recuperating in it, a newspaper called *The Come-Back* carries the nation's message of good cheer to the victims of the war. It is the only known newspaper which is longing for a short life. It will discontinue publication as soon as the last soldier is rehabilitated. Its initial issue, dated Dec. 4 claimed to express the universal thought of its inmates. It said that the chief thing the wounded sons of Uncle Sam wish to say is: "Please don't coddle me. What I want is a chance to get back into civil life in the same spirit of independence that takes a fellow 'over the top.'"

In Pennsylvania, the state department of labor for some time has been considering the problem of the crippled in industry. With the possibility of a large number of crippled soldiers returning from the war, the department made a survey of Pennsylvanian industries and to date from about 1000 firms a total of over 50,000 positions have been found available. The highest number of places open, according to disability classification, is 6797 for men with facial disfigurements, the next being 5936 for persons deaf in one ear; 5618 for one-eyed men; 4324 for men with one hand, while 2864 places are open to men who lost their speech.

In Youngstown, O., the chamber of commerce has appointed a committee which is to have charge of the soldier and sailor rehabilitation work. W. E. Meub, secretary to James A. Campbell, president of the Youngstown Sheet & Tube Co., is chairman. His committee will co-operate with the civilian relief committee of the Mahoning chapter of the American Red Cross in this highly important work.

In all these and many similar efforts the iron and steel and allied industries are co-operating enthusiastically and whole-heartedly. No other industries were so hard hit by the draft which sent 4,000,000 men into Uncle Sam's service. No other industries are being called upon so largely to find places for these returned men and it naturally follows that the larger percentage of war's disabled is being absorbed by these industries.

Cleveland Firm Employs Cripples

For a long time the Standard Tool Co., Cleveland, has prepared itself for what now has become a national duty. It is in a position to give employment to crippled soldiers who have lost one or both of their legs, for the reason that for many months it has been hiring such men for work on its machines. The company does not hire men who have lost one or both arms, because the nature of its operations requires the use of fingers. It recently had 25 men who had lost the use of either or both legs and one of the company's officials recently stated: "We have room for more crippled men, but returned soldiers or sailors will have the first call." One of the company's employes, Richard Daly, who lost both legs in an accident, operates a hand milling machine. Charles Jones, who has but one leg, is employed as a drill inspector.

W. F. Engelhart, who is safety and welfare engineer of the Atlantic Steel Co., Atlanta, Ga., has a plan which typifies the general attitude of the iron and steel industry toward the returned soldiers. He states: "We plan to replace every man who left our employ for national service. Where possible, they will be given their old jobs back. We will either place those who return incapacitated at work they can handle or train them for other positions. We believe if each plant will not only take back its own men, but find places for a share of the remainder, the problem will be solved."

A committee has been appointed at the plant of the American Rolling Mill Co., Middleton, O. Its duty will be to care for all returned former employes and retrain them for such jobs as their disabilities require. A special shop has been set aside for this work, wherein likewise those who are industrially disabled will receive training. The committee's personnel is, A. J. Beatty, director of education, chairman; Dr. H. H. Smith, company physician, and S. R. Rectanus, director of employment.

One of the chief problems confronted by the replacement of crippled men in industry is how to differentiate. If a foreman favors a returned soldier with a minor injury by giving him light work and in other ways making his job a sinecure, he will incur the disfavor of the other employes and antagonize them against the man himself. Then, too, as has been demonstrated in Canada and other countries, a feeling on the part of the returned soldier that he is entitled to hero worship, coddling and favoritism must be combatted. That is why the national government has taken hold of the problem of the returned soldier.

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TOOLMAKING CLASS IN THE MACHINE SHOP OF McGILL UNIVERSITY, TORONTO, ONT., WHERE RETURNED SOLDIERS ARE TAUGHT MACHINE CONSTRUCTION, ETC.

Problem a National One

It early became evident to the government authorities that if any real rehabilitation work was to be done for the soldiers and sailors who would return from the war, all efforts by individuals and communities would have to be subordinated to national endeavor. When employes left for national service, promises for employment upon their return were handed out promiscuously. After those employes were in actual service and their names commenced to appear in the casualty lists under "wounded, degree undetermined," department heads held meetings to plan the making good on those promises. Communities were busy arranging their individual programs of rehabilitation work. This all presaged conflict and little constructive work. The United States benefited from the experiences of other countries, all of which came to realize that the problem was a national one. Germany had built up a wonderful reclamation system before the war was started. All of the allies early in the war gave attention to the problem as individual nations. In Canada right from the be-

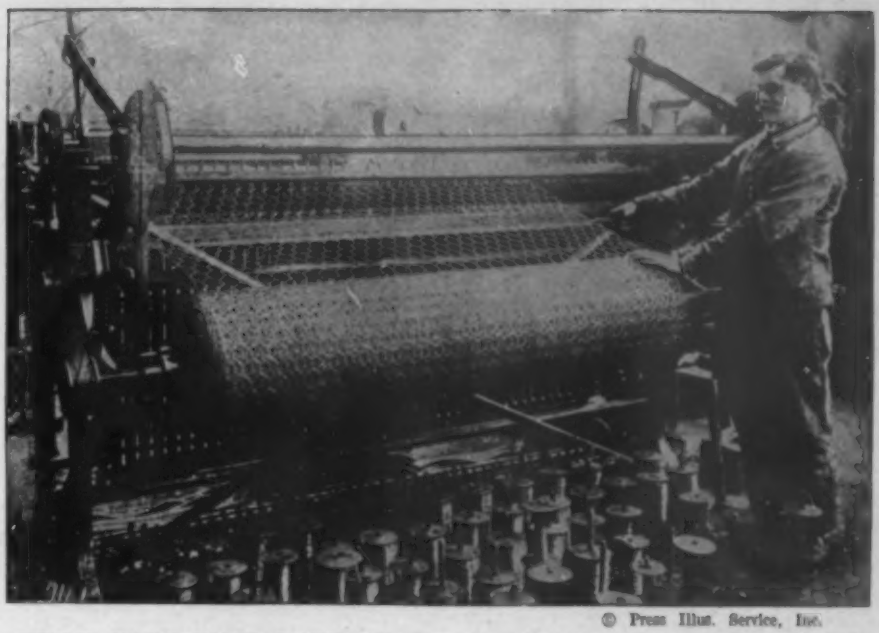
ginning it was made a matter of national concern and the United States patterned its plan in large measure after Canada's methods. While Canada's army relatively was a small one it was large when the size of the country was considered. It numbered approximately 500,000. That country, however, led the world in the re-education of the soldiers who returned from the conflict. Under its plan 196 courses of vocational education are offered. R. E. Fitzgerald Dalton, general superintendent of the Red Cross transition work in Toronto, stated recently: "About 90 per cent of the returned disabled soldiers engaged in work different from and better than their prewar occupations. Of 4000 returned soldiers in Canada that have been re-educated by the government, 71 per cent are working at their new trades; 24 per cent engaged in other work when opportunity presented itself and only 5 per cent were failures." Canada's experience has shown that about one-third of the injured eagerly jump at the chance for re-education; one-third have to be persuaded and the other third take it after much urging.

Rehabilitation Bill Becomes Law

With data similar to this in hand, the vocation rehabilitation law was introduced in the senate on April 8, 1918, by Senator Smith of Georgia. On April 10, Representative Sears introduced it in the house and on June 27 it was approved by the President. It carried an appropriation of $2,000,000 for the project of rehabilitating soldiers and sailors of the war. By its terms, control of re-education was placed in the hands of the federal board for vocational education; co-operation was provided for as between the board and the medical services of the army and navy, the bureau of war risk insurance and the department of labor.

While the injured soldier or sailor pursues vocational training he receives a sum equal to the amount of his monthly pay for the last month of his actual service, or a sum equal to the amount to which he would be entitled under Article III of the war risk insurance act, as amended, whichever is the greater. For the families of enlisted men undergoing training, the act provides that they shall receive compulsory allotment and family allowance according to the terms of Article II of the war risk insurance act and makes available the military and naval family allowance appropriation provided by section 18 of the war risk insurance act of Sept. 2, 1914, for the payment of such family allowance.

While the bill embraced a more comprehensive plan for soldiers and sailors than would have been thought necessary for a war to end six months later,



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CRIPPLED ITALIAN SOLDIER WORKING IN A BARBED WIRE FACTORY. ITALY SENDS MANY OF HER EX-SOLDIERS INTO FACTORIES FOR PRACTICAL TRAINING

the machinery it put in action will doubtless be utilized for the country's industrially crippled. In fact, congress now has before it a bill to make the vocational rehabilitation act applicable to those crippled in industrial establishments. If 80 per cent of those crippled in battle can be made capable of taking a responsible place on industry's payroll by rehabilitation methods, a similar number of the industrially disabled can be reclaimed for better positions. Since there are over 700,000 industrial accidents annually in the United States and over 70,000 wage earners each year are so seriously injured that they lose over four weeks time, which means 2333 each working day, according to C. W. Price of the national safety council, Chicago, a wonderful reclamation work has been started under the impetus of war. Fewer cripples and completely disabled men have come out of the four years of war recently ended than from any other war in military history, despite the fiendish appliances of the enemy. By the utilization of the country's vocational re-education system, the percentage of those seriously handicapped by industrial accidents is to be lowered from year to year. The Red Cross has made a survey of cripples in industry which shows that 85 per cent are 100 per cent efficient. A survey made in the shops of the Henry Ford interests in Detroit developed the following facts: 670 jobs

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ONE-ARMED SOLDIERS DISPLAYING EXCEPTIONAL PROWESS AS WIELDERS OF THE SLEDGE AT AN INTERALLIED EXHIBITION IN ENGLAND OF WORK FOR DISABLED SOLDIERS

that could be filled by legless men; 2637 jobs by one-legged men; 715 by one-armed men and 10 by totally blind men. It is stated that the time required for cripples to become expert at the various operations ranges from one day to two weeks.

Welfare Departments Co-operate

Welfare departments of the various large iron and steel companies in the last few years have reached a point where they have rendered and are rendering humanity an incalculable service. Many of the companies which conduct them have signified their willingness to co-operate with the government in reclaiming disabled soldiers and sailors. Many have indicated a desire to have the federal board for vocational education make use of their shops as schools in which practical experience and a working knowledge of machinery may be obtained.

Such training likewise is given in the various hospitals and schools under the government's jurisdiction. The American Red Cross Institute for the Crippled and Disabled in New York, which was founded through the philanthropy of Jeremiah Milbank for the purpose of proving that the industrial crippled could be a self-supporting, useful citizen, has opened its doors to the soldier-crippled. The government's general hospital at Lakewood, N. J., is teaching many lines of activity which refit men to enter the iron and steel and allied industries as skilled workers.

The federal board for vocational education, with headquarters at Sixth and E streets, Washington, has branches in different districts. District No. 1, comprising Maine, New Hampshire, Vermont, Massachusetts and Rhode Island, has its office in Boston, room 433 Tremont building; district No. 2, with offices in room 617, 280 Broadway, New York City, covers the states of New York, New Jersey and Connecticut. District No. 3, with office at 1000 Penn Square building, 1416 South Penn square, Philadelphia, takes care of Pennsylvania and Delaware. District No. 4 comprises the states of West Virginia, Maryland and the District of Columbia and has an office in the Baltic building, 606 F street NW., Washington, D. C. District No. 5, for the states of Florida, Georgia, North and South Carolina and Tennessee, has its office in the Candler building, Atlanta, Ga. District No. 6, covering Louisiana, Mississippi and Alabama, has its office in room 822 Maison Blanche annex, New Orleans, La., while district No. 7 covers the states of Indiana, Ohio and Kentucky and has an office in rooms 906 and 907 Mercantile Library building, Cincinnati. Other district offices are located in St. Louis at 517-521 Chemical building; Dallas, Tex.; Denver, Chicago, Minneapolis, San Francisco and Seattle.

A vocational advisor is appointed to each of the government's hospitals with whom the soldier who has been wounded, consults before or after he is discharged from the army. He is not discharged until he is as well physically as it is possible for the government with all the means at its disposal is able to make him. The surgeon general of the army has jurisdiction over the soldier from the time he is injured until he is restored to good physical condition, when he receives his honorable discharge from the service. No compulsory method is used to have the soldier take reeducation. It is entirely voluntary on his part whether he shall take advantage of the government's offer or not. The vocational advisor, however, points out the advantage of the plan, reading matter is given to him, treating the subject from every angle. It points out that the physically handicapped might leave the hospital and immediately find a place in industry through sympathy superinduced by patriotic fervor, but in slack times and when the present high tension relaxes, the cripple in competition with the physically whole would lose out in the battle for existence. As a result, practically all who leave the hospitals take advantage of some one of the courses in industrial education offered to him. These include lathe and drill operation, motor driving, industrial drafting and designing, watch and toolmaking, making of surgical instruments and electrical parts and other industrial vocations.

Civilians Are in Charge

From the moment the soldier enters the hospital and physiotherapy commences or as soon thereafter as is possible, occupational therapy is given him which has in view the vocational reeducation he is to receive. As it took soldiers to turn civilians into soldiers, so the task of changing soldiers into civilians is entrusted to civilians. Around the wounded or disabled soldier in the hospitals and later in the schools are teachers, instructors and advisors, many of them physically handicapped like himself. This is for the double purpose of dispelling the tendency of the individual to despair because of his handicap and of encouraging him to self effort and the will to do by showing him what others are accomplishing. The entire system is built up on the idea of obliterating the cripple as war's aftermath. Disabled and physically handicapped, many who leave the hospitals necessarily are, but they are not crippled. As has been the case in Canada, so now it is in the United States. Many who have lost an arm, a leg, two arms, two legs or both eyes or have suffered some other disability leave the hospitals and later the schools to take a better place in industry than they had occupied previously. Thus the most inhuman war of history has been made humane.

Government Pays Debt to Humanity

OUT of war's red glare have come thousands of casualties. For several weeks transports have been bringing home their quota of wounded, sick, maimed and shell-shocked. How the government is discharging its debt to those who placed their lives in jeopardy for it, is outlined in the accompanying article. Co-operation freely is being offered by industry, particularly the iron and steel industry, which sees in the figure opposite "wounded in action" in the casualty list a potential source of labor supply. Reclamation machinery set up under the impetus of war also will be utilized for the industrially disabled, who in the aggregate, annually exceed the country's total casualties sustained in the bloody conflict now ended with victory achieved.

HENRY FORD HOSPITAL, DETROIT, AS IT APPEARED NOV. 1, 1918. THIS WAS TAKEN OVER BY THE GOVERNMENT ON SEPT. 16, 1918, AND BECAME UNITED STATES GENERAL HOSPITAL NO. 36

Metal Industries Flower in War

Chemical Progress Marvellously Accelerated by Urgent Demand and United States is Rendered Independent of Foreign Supplies on Many Indispensable Metals, Ores and Alloys—Mining Development Stimulated

BY GUY F. CREVELING

ONE of the important economic by-products of the war has been the development of extensive industries to meet the specialized demands of modern warfare. This development has been particularly true of the production of many alloys, minerals and rare metals. Much capital has been invested, mines have been opened and smelters and refineries constructed in various sections of the country. Some of these industries were born before the war but received a tremendous impulse from the conflict, while others are purely and simply offshoots of the war.

Elements which prior to the conflict were regarded as scientific curiosities, have become commonplace in the metal markets. For example, the inauguration of aerial combats, created a need for "tracer" bullets. Magnesium metal was found adapted for this and other uses. Before the war magnesium metal was not produced commercially in this country, but a flourishing industry has sprung up, with an output in 1917 of 115,800 pounds. The need of the "tracer" bullets has passed and now the hopes of the industry lie in the development of other uses for the metal, such as in alloy manufacture.

The feverish pressure of war preparations required the topmost speed of machine shops turning out munitions and consequently a demand was created for various kinds of high speed tool steels. The production of armor plate, ordnance, shells, motors, rifles, locomotives, armor piercing projectiles, bombs, mines and other munitions created a demand for special steels with properties suitable for specific purposes. Thus many new ferroalloys were developed. The scientific brains of the country have been mobilized in laboratories and workshops, endeavoring to turn the rarer elements to commercial account. Under the pressure of war, the normal chemical progress of generations has been condensed within the past few years. Peacetime industry will benefit from this progress.

Another factor in developing the American alloy and metal industries has been the shutting of the door on materials produced in enemy coun-

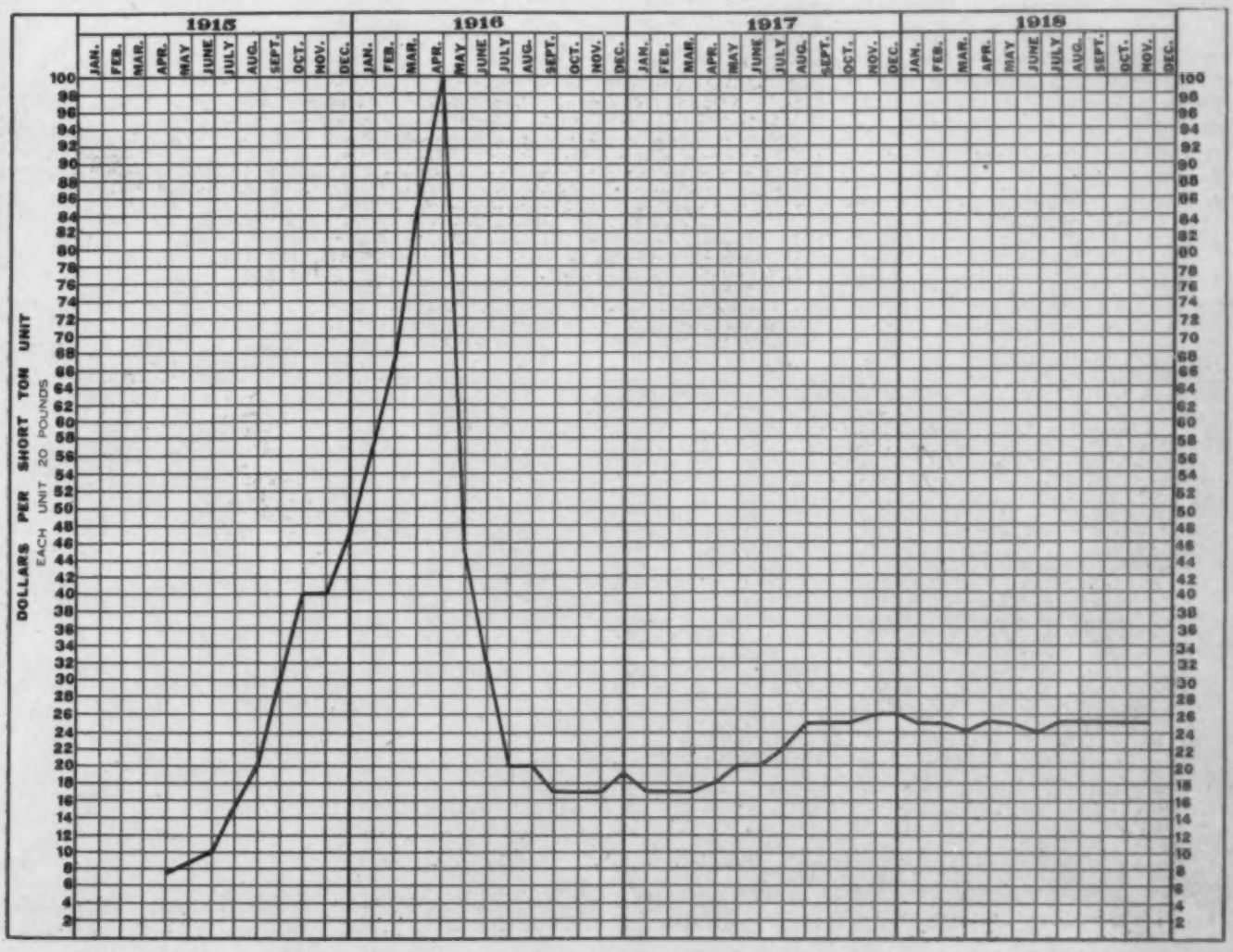


CHART SHOWING FLUCTUATION IN PRICE OF TUNGSTEN ORE DURING THE WAR PERIOD

tries. Prior to the war, for example, Germany predominated in the smelting and marketing of ferrotungsten, yet she imported the tungsten concentrates from the British empire. Another instance is the metal selenium. When the war began glass manufacturers were unable to obtain manganese dioxide of a particular grade, used for neutralizing the greenish color of untreated glass. They turned to selenium, which previously had been of interest only in the laboratory, and consumption of selenium grew from practically nothing in 1913 to about 60,000 pounds estimated for this year. Still another factor in the stimulation of domestic production of metals and minerals, has been the lack of shipping space.

In former years, the United States depended largely on imports of special steels from France, Germany and other European countries. Before the war broke out, America was beginning to manufacture special steels on a fairly large scale, but imported the ferroalloys to a great extent. Later it undertook the manufacture of the ferroalloys, but depended in some cases upon imported ores, such as chrome and manganese. After this country entered the war and shipping space grew scarcer and scarcer, American industry was threatened with a shortage of some of these requisite materials. Consequently the war industries board and the bureau of mines took energetic steps to stimulate domestic production of such materials. These efforts were attended with a degree of success.

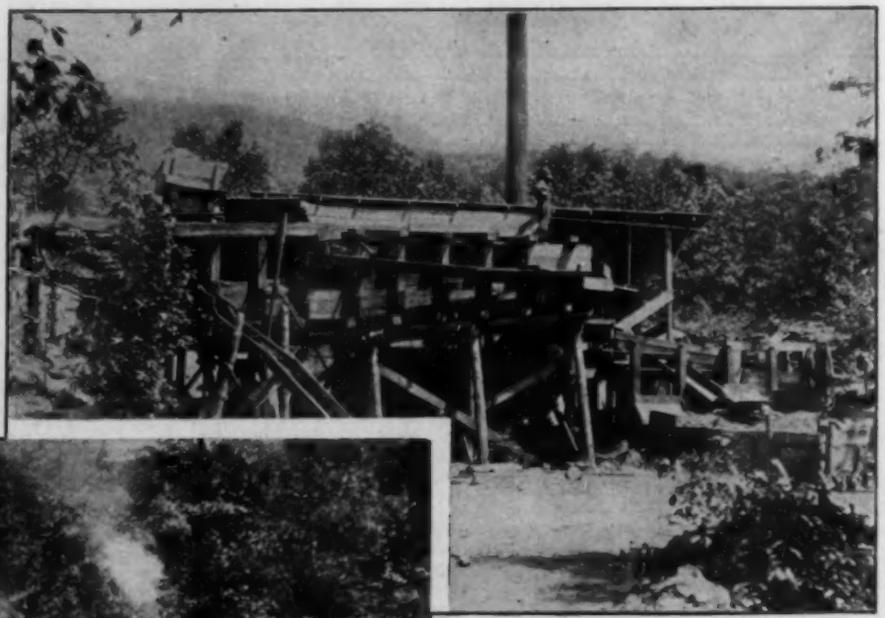
Now that the war is over and the emergency passed, the question arises, what will become of these new industries? Some of them, particularly ferroalloy manufacturers, are here to stay. America long ago made a name for itself as a quantity producer of steel. Henceforth it will be famed for special quality steels; but some of the metals will be shuffled into the discard.

Would Encourage Mining

Bernard M. Baruch, chairman of the war industries board, went before the house committee on mines and mining last March and urged that a bill be passed which would guarantee the prices of war minerals so as to encourage the development of new mining property. "We do not know," he said, "when the high seas may be closed to us."

A bill was finally passed, but it does not protect the producers of manganese and chrome and some other minerals who began the production of these minerals at the persuasion of the war industries board and the bureau of mines. The act appropriates $50,000,000 as a revolving fund to enable the President to contract for war minerals for not exceeding two years, purchase, store and sell them at reasonable prices, and if necessary to take over undeveloped or idle mineral lands or deposits and operate them or cause them to be operated. The President also is empowered to fix a rate of duty on imported commodities if necessary to protect the United States government from loss. The items included in the act are: Antimony, arsenic, ball clay, bismuth, bromine, cerium, chalk, chromium, cobalt, corundum, emery, fluorspar, ferrosilicon, fullers' earth, graphite, grinding pebbles, iridium, kaolin, magnesite, manganese, mercury, mica, molybdenum, osmium, sodium, platinum, palladium, paper clay, phosphorus, potassium, pyrites, radium, sulphur, thorium, tin, titanium, tungsten, uranium, vanadium and zirconium.

The question has been raised as to whether the war minerals act does not preclude a regulation of war minerals should there be no shortage. If this interpretation should be sustained it would prevent any action with regard to such minerals as chromite, manganese and pyrites, of which there has been an overproduction. To alleviate the position of the chrome market, the war trade board last autumn imposed an embargo on importations from Brazil, New Caledonia and other countries. This action, taken with a view to stabilizing the chrome ore market, resulted in complaint from chrome ore importers and consumers. Some of the consumers have objected to the domestic chrome ore on the ground that it is high in silica and therefore not as suitable to their purposes as some foreign ores. Importers complained against the embargo on the ground that they had purchased tonnages of ore in the foreign markets on the



MINING MANGANESE ORE BY STEAM SHOVEL, BATESVILLE, ARKANSAS. TYPICAL LOG-WASHING PLANT FOR MANGANESE ORE, BATESVILLE, ARKANSAS

expectation of being able to ship it.

With the wisdom of hindsight, one now concludes that the Washington authorities were a trifle hysterical last spring. High prices were a sufficient stimulus without legislation. It is likely the war minerals bill now will become a dead letter. The war boom in the chrome and some other markets has passed. Earlier in the war, the lobby of the Palace hotel at San Francisco saw some exciting days. Dealings involving thousands of dollars in mining properties were transacted. Farmers by the hundred left their plows and prospected about their farms for chrome, magnesite and other minerals. Now the owners of some of these properties fear they are left to hold the bag.

Supplies Are Increased

The rare metals and minerals may be grouped in two classes, looking at them from an industrial standpoint. One class includes those used in alloys in iron and steel manufacture. This class has become so large and so important that the materials used can no longer be called rare. The demand for them has brought increasing supplies from properties developed all over the world. The other class includes metals and minerals used in comparatively small quantities for varied industrial uses, both in this country and abroad.

Without the use of high speed tool steels, it is estimated the United States and the allies could not have produced one-fifth of the munitions requiring machining, for the capacity of many plants is limited by the speed with which the boring and tooling can be done. The metal tungsten was brought into much prominence. Its high melting point, over 5900 degrees Fahr., its hardness, its great tensile strength of over 300 tons to the square inch, its resistance to rust or attack by acids and its power of imparting these qualities in considerable degree to alloys, made it especially valuable in high-speed steel. It answered the need for a material that would retain a hard and cutting edge under high temperatures, taking up in the form of heat the greater part of the energy furnished by the driving motor. The driving of tools made of ordinary carbon steel until they reached a white heat, of course, would render them hopelessly soft. Although known for the past 50 years it has only been within the past decade that tungsten has been of any considerable use in industry and only since the war has it been of world-wide importance. A small amount of tungsten, 2 to 5 per cent, has long been used to make steel self-hardening. Thus a tool of this steel need only be left in the air to cool and it becomes hard, without the ordinary cooling and quenching operations. Larger proportions, 10 to 25 per cent, make a tool which stays hard even when the tool becomes red hot.

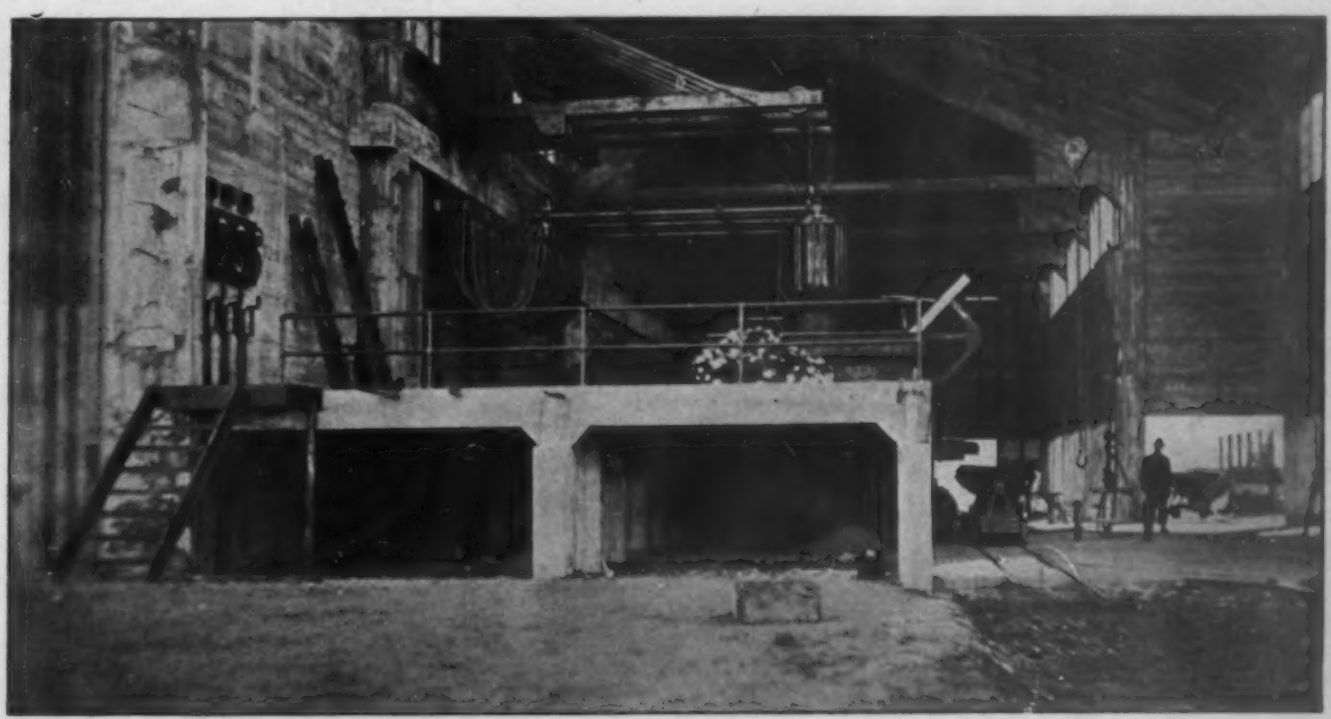
Before the war, metallic tungsten sold at about 70 cents a pound contained and tungsten ore at about $7.50 to $8 a unit, a unit being 1 per cent of a ton. But a worldwide demand for tungsten was created with the outbreak of the war. Machining of shells alone was enough to account for that. Then the price began to rise rapidly.

The British authorities adopted a fatal policy early in the war. They started out with bargaining, fighting the inevitable advance in prices, and failed to get what they wanted. Then they practically commandeered the supply of tungsten ore in the empire, appointing official brokers and fixing a price equivalent to about $800 a ton. But this caused producers to fight back, restricting production, in view of the high prices prevailing in America. Eventually the British government raised the price high enough to stimulate mining. In the meantime the open market price went to about $100 a unit. Such prices stimulated production. A ton of ore that yielded 60 per cent tungsten trioxide when the price was $100 a unit, sold at $6000 a ton. A carload of 40 tons would have sold at $240,000. A deposit yielding a single carload was worth a fortune, so it is not surprising that production was stimulated. Since that time prices have declined. A carload of 60 per cent tungsten today is worth about $50,000 to $60,000, depending upon the amount of impurities contained. But it is still high enough to make the working of the mines profitable.

America Springs to the Front

The output of tungsten ore now is fully five times what it was before the war. Previously Burma was the greatest producer in the world and is now England's chief source. The United States is now the largest single producer of tungsten ore.

Korea, Bolivia, Peru, Argentine,



VIEW OF PLANT OF PACIFIC COAST STEEL CO. FOR MAKING SILICOMANGANESE BY ELECTROLYTIC METHOD

GEOLOGICAL FORMATION BUCKEYE MINE, NEAR TRACY, CALIFORNIA. VIEW OF OPEN CUT AND ORE CHUTE FROM SUMMIT ABOVE CAMP

China, Portugal, Australia and Japan are important sources, while new mines have been opened in South America, New Zealand, the Malay states, Indo-China and Siam. Before the armistice was signed, Nov. 11, an interallied control of tungsten concentrates was adopted, as in the case of tin, under which world supplies of tungsten were allotted among the allied and American governments.

Before the war, Germany led the world as a smelter of ferrotungsten and similar alloys. Now a smelting industry has been built up in the United States and the market for concentrates probably has passed permanently out of German hands. The United States, formerly an importer of ferroalloys, has become an exporter, in addition to supplying its domestic needs. Smelters have been constructed in the west, near the ore supplies, also in the east, near the steel districts and water power. Some of the large ferrotungsten makers have their own mines. Some of the alloy steelmakers make their own ferroalloys and are closely associated with importers and domestic producers of ores.

Benefited by War Demand

It is estimated the world production of metallic tungsten now is about 7500 tons annually, of which about 90 per cent is in the form of ferrotungsten. The toughness and hardness of tungsten when imparted to steel make it valuable for such purposes as shafts, axles, motor valves, and the like. If the price of ferrotungsten, now about $2.40 a pound contained, comes down, it will find a ready market for such purposes. A few hundred tons of pure metallic tungsten, tungsten powder and acid are used annually in the manufacture of electric light filaments. Compounds of tungsten are also used in making colors for glass and porcelain, and for other minor purposes. But its most important use is in the making of special steels. Undoubtedly tungsten is one of the metals permanently benefited by the war demand.

Chrome was used in the manufacture of hard cutting tools even before tungsten and it also has benefited from the war activity. Chromium metal is tough and imparts hardness, although it adds brittleness to an alloy. At present ferrochrome sells for about 40 cents a pound contained, the price varying with the amount of chromium and the amount of carbon contained. Ferrochromium is used in making what is known as chrome steel. Hard cutting steels and armor plate are made of steel containing about 2 to 4 per cent chromium. Chromium is specified for some parts of the Liberty motor. It is understood the Germans, deprived of tungsten, in the last few years of the war used chromium for their high speed steels.

More Propaganda

Another metal which Germany is popularly credited with having utilized in large measure as a substitute for tungsten, is molybdenum. Opinions vary in this country regarding the future of molybdenum in the manufacture of special steels. Some persons hold that molybdenum is particularly adapted for armor plate hardening and gun linings and that it is superior to tungsten steel for some purposes. Others hold the opposite view. In any event the use of molybdenum is in its infancy so far as American steel works practice is concerned. Not much is made public concerning it, but an American interest has a mine and plant in Colorado said now to have a capacity equal to the world's capacity a few years ago. The principal molybdenum minerals are molybdenite, a sulphide and wulfenite, a compound of lead and molybdenum oxide. The ore is usually treated chemically to extract the lead and other elements, then smelted directly in the electric furnace. The ferro, when running as low as 50 to 60 per cent molybdenum, can be tapped from the furnace; when it runs to 80 per cent it cannot be tapped without freezing, in which case the furnace is cooled and taken apart, leaving a mass of solidified alloy after

ABANDONED MANGANESE MINE REWORKED BY MODERN METHODS, BATESVILLE, ARKANSAS

which the furnace is rebuilt. The price of standard ferromolybdenum now is about $3.50 a pound.

One of the best known steel strengtheners is ferrovanadium. This alloy was originally assisted into prominence by an automobile manufacturer, who, looking for efficiency, adopted vanadium steel. This alloy now is generally used in locomotive frameworks, automobiles and motor trucks. With ordinary soft steel of the same weight the automobile would be a much weaker machine. The addition of vanadium helps the steel to withstand heavy shocks and vibration. Standard ferrovanadium contains about 35 to 42 per cent metallic vanadium, which has been selling all the way from $5 to $11 a pound contained vanadium, as against $2.50 to $3 a pound in normal times. The high price is due partly to the scarcity of the black sulphide ore from Peru, resulting from shipping shortage. Vanadium is also produced from the radium ores of Colorado, from lead vanadate and from other ores, but these ores are lower in vanadium content and more expensive to treat. Only small quantities of vanadium are needed to improve the steel, the usual amounts being about 0.2 to 0.5 per cent. Ferrovanadium is made for the most part by the thermit process, using aluminum as agent.

Other Alloys Now in Use

Ferrotitanium is one of the alloys which is as yet in its infancy. Only one firm in America manufactures it. The element titanium is abundant, occurring in immense deposits of ilmenite, or titanic iron ore. The alloy runs 15 to 25 per cent titanium and is used in steel as a refining agent to remove oxygen and nitrogen. Thousands of tons of steel rails have been treated in this way, the tests indicating mechanical improvement with the introduction of small quantities, about 0.10 to 0.20 per cent of titanium.

Uranium metal has been used in ferroalloys only within the past two or three years. This metal occurs in conjunction with the extremely rare metal radium. Its high price is said to have handicapped its commercial progress, but it is difficult to get information on points like this as firms experimenting with a new alloy sometimes like to keep their results to themselves.

Ferrozirconium has been talked of rather widely in recent months. Numerous alloys of zirconium have been prepared. One containing 60 to 90 per cent zirconium and the rest mainly iron is said to be substantially free from metalloids and oxides, also malleable and ductile. A self-hardening alloy for cutting tools consists mainly of nickel, or nickel and cobalt, together with 2 to 4 per cent zirconium and not exceeding 35 per cent chromium. Ferrozirconium, made by the thermit process and containing up to 35 per cent zirconium has been used to some extent instead of ferrotitanium as a steel purifier. It is said that Germany has used this alloy also to produce an extremely hard steel for armor plates, armor piercing projectiles and bullet proof sheets. Our own government also has manifested considerable interest as to ferrozirconium, but information along this line naturally has not been forthcoming.

Cobalt and nickel steadily are becoming better known to steelmakers and both of them undoubtedly are in the industry to stay. They are used in rail steel and in plating. They are also used in compounds with other metals, such as chrome, in making special steels. Ferroboron is another alloy whose valuable properties have not yet been fully determined. Ferroaluminum at one time was commercially produced. With aluminum metal prices at current levels, the use of ferroaluminum is regarded still as commercially economical.

Distinguished from these newer ferroalloys are ferromanganese and ferrosilicon, both of which have long been utilized widely as deoxidizers for many years. Yet each of these alloys has experienced deeply the effects of war conditions. The manufacture of ferromanganese was begun more than 50 years ago, first being made in crucibles, later in blast furnaces, but now is being produced also in electric furnaces. It is made with 30 to 85 per cent manganese, 3 to 5 per cent carbon, a little silicon and the rest iron. When running 30 per cent or less in manganese it is called spiegeleisen. The steelmaker prefers the higher manganese content for most purposes, but these require rich manganese ores. It was in respect to ferromanganese that the steelmaker felt the first pinch of the war after its outbreak four years ago. The United States, prior to 1914, imported over one-half its ferromanganese requirements. In 1914 the domestic production amounted to only 54 per cent of the total of 183,728 tons used. In 1917 the total consumption was 331,831 tons, of which the United States produced 86 per cent, while for 1918 the estimated proportion of domestic output to total consumption is 90 per cent.

Before the war, most of the manganese ore used came from Brazil, India and Russia. Later, with the shortage of shipping, it became necessary for the United States to develop its own manganese ore resources. The production of domestic ore in 1914 was 2635 tons, or less than enough to make one-half of 1 per cent of the ferromanganese required. In 1917 this country's mines produced 113,734 tons of high grade manganese ore, or enough to make 10 per cent of the ferromanganese required. For the year ending June 30, 1919, it is estimated that at least 50 per cent of the ore required to make the country's supply of alloy will be produced in the United States, even provided the consumption of ferromanganese continues at the maximum rate of wartime consumption. In this industry, as in the chrome ore industry, the government encouraged development and now that there is apparently an overproduction of domestic ores, the investors in such properties are showing some anxiety. Some imports are inevitable, as return cargoes on ships which otherwise would come back light. An official of the war industries board in October last issued a statement in which he said there was no longer any apparent need for opening up new supplies. The work done, however, in stimulating domestic production, was remarkable, for previously it had been thought our own manganese resources were insignificant.

Ferromanganese is generally used by steelmakers as a reagent to remove the oxygen which is contained in the steel like dissolved gas in charged soda water.

Thrive on Water Power

The manufacturer of ferrosilicon is a large and rapidly growing industry, thriving particularly where water power is cheap. It has made tremendous strides since the beginning of the war. One plant, which began to operate less than two years ago, has since more than quadrupled its capacity. Other manufacturers have also enjoyed phenomenal increases. This alloy is also used as a deoxidizer, being about four times as active as ferromanganese in reducing blow holes and producing sound castings. Manganese, however, is usually used to do the bulk of the deoxidation and silicon afterwards. Ferrosilicon is particularly useful in making sound steel castings which are cast into their ultimate form and do not have to be rolled into shape. Ferrosilicon may run from 15 to 90 per cent silicon, but the most common form is the 50 per cent grade. It is made from ordinary silica, either quartz or sand, reduced by carbon in the presence of iron or scrap. Only the lowest grades are made in blast furnaces, the higher grades being made in electric furnaces. In normal times, 50 per cent ferrosilicon has sold as low as $50 to

$60 a ton, but the market now is around $150 per ton.

In addition to the metals used in ferroalloys, in steel manufacture, a number of new metals have been developed in recent years for general industrial uses. Some of these rare metals are produced as by-products in refining lead, copper, gold, and other metals. The metal bismuth, a by-product of lead refining, has been influenced by the war, being used largely as a compound applied to surgical dressings. It has an extremely low melting point and so is used in combination with cadmium, in making fuses for sprinkler fire extinguishers.

Cadmium formerly was made only in Germany, but the United States has taken first place. In 1913, a total of 54,198 pounds of metallic cadmium were made in the United States as against 81,993 pounds in Germany. But in 1917 American production was 207,408 pounds, while no figures were available as to Germany.

Cadmium is used in metallic form principally in alloys and its various salts are used in the arts, in medicine and in electroplating. Cadmium was declared contraband of war by the various belligerents and, therefore, must have had military uses, but these uses were not made public. Cadmium is said to be used in smoke bombs for signalling and also to be used in a fraction of 1 per cent in copper wires and cables in France and Italy.

Selenium already mentioned as used by glassmakers is a by-product of electrolytic copper refining. The price of selenium through 1918 was about $3 per pound. Thallium is another rare metal used in glassmaking. It was formerly made in Germany and used by glassmakers there for certain grades of hard instrumental glass.

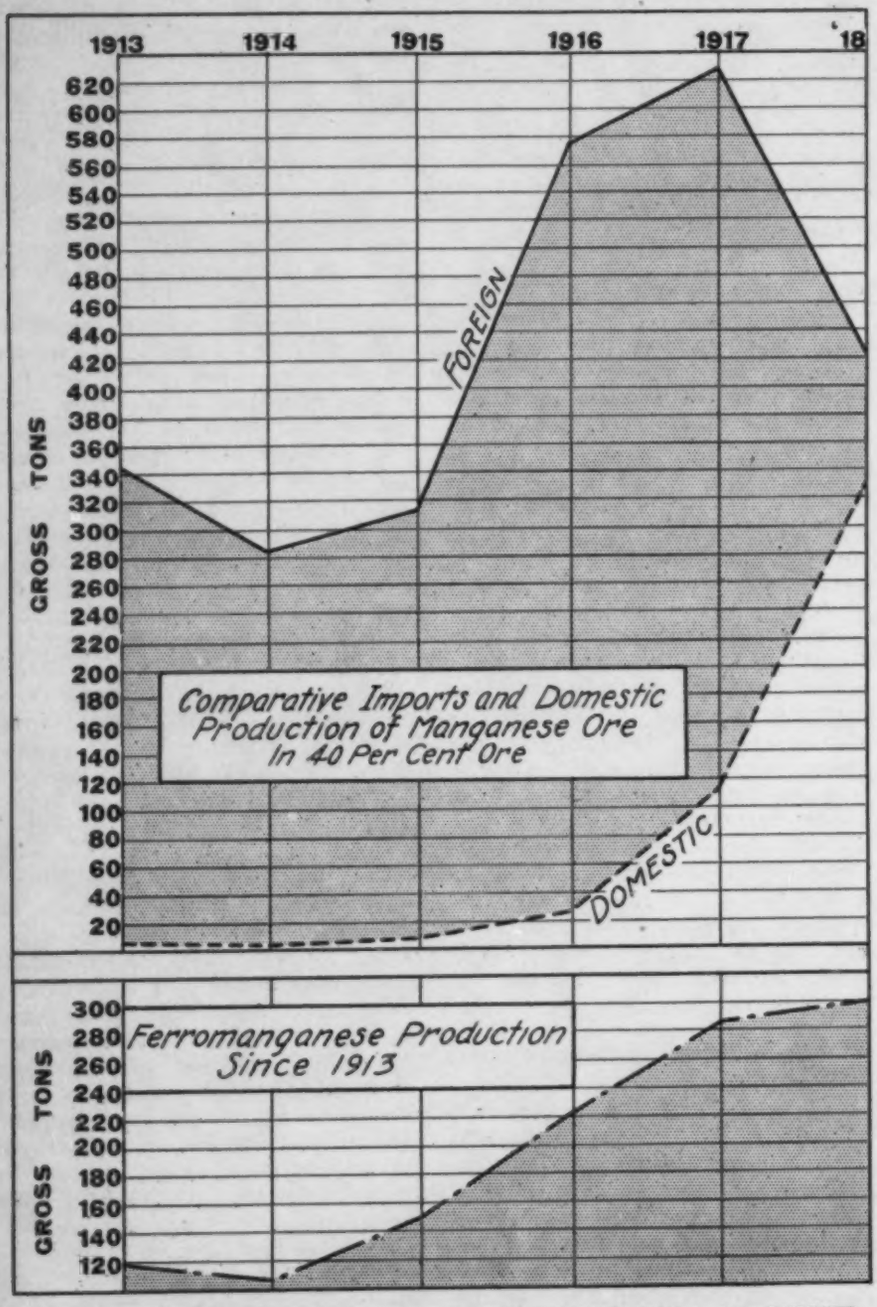
Before the war, Germany almost controlled the gas mantle industry of the world. In this industry an oxide of the rare metal thorium is used. The source of thorium is monazite sand, found principally in India, Ceylon and Brazil. The German thorium syndicate controlled the Indian and Brazilian companies, the Ceylon deposits having been developed since the war. Now the German syndicate has been shorn of its power and the close of hostilities found the British almost as strongly in control of this industry as the Germans were previously.

The metal strontium before the war was chiefly produced in Germany where it was used in producing sugar from beets. It came into brisk demand during the war as a result of the need for the compound strontium nitrate, used in red signal lights on the battlefield and also in railroad beacons. The United States now is producing this metal in some quantity.

Other rare metals which had been influenced by the war are the platinum group, including platinum, palladium, and iridium. Platinum increased from $40 a troy ounce to more than $100, a maximum price finally being fixed by the United States government at $105 an ounce. The loss of the Russian production has been an important factor in this market. Platinum is used in the jewelry and dental trades, but it is also needed for contact points in some electrical work and also as a catalyst. It was needed especially during the war for use in sulphuric acid works.

There are other rare metals which have been introduced into the world on a commercial scale since the beginning of the war.

Many of these industries are here to stay. It is to be hoped the government will do all in its power to foster them, by the imposition of proper tariff protection or by other means. The steelmaker can afford to pay a little higher price for his ferroalloys if he can be assured of a steady domestic source of supply rather than rely on the foreign maker who cannot be free of prejudice in the interest of his own country's steel industry. The same statement is true regarding the glass, textile, leather, chemical, and other industries using rare metals and minerals. These industries also will find ultimately it is profitable to patronize home industry.



HOW DOMESTIC PRODUCTION OF MANGANESE ORE HAS CUT DOWN IMPORTS AND INCREASED FERROMANGANESE OUTPUT. FIGURES IN THOUSANDS

Annual Market Reviews for 1918

Pig Iron
Ferroalloys
Coke
Semifinished Steel
Plates
Structural Shapes
Merchant Bars
Sheets
Tin Plate
Rails
Wire Products
Wrought Pipe
Cast Iron Pipe
Old Material
Warehouse Trade
Nonferrous Metals

War Dictates Industry's Course

Remarkable Concentration of Effort by Iron and Steel Makers at Nation's Call Establishes Bright Record of Patriotism and Accomplishment During Year of Extraordinary Market and Operating Conditions

AMERICAN iron and steel, joined in purpose and effort as never before, proved their strength as a national asset in 1918. They faced the supreme test and responsibility of their history. And they met the crisis so unitedly, so patriotically, and withal, so successfully, that they may lay just claim to having served as one of the truly major instruments of victory. In so doing they wrote without question the brightest page of their long record of great initiative, achievement and progress.

War, dominating all, harmonized the relations of industry and government in a way that was as rare in American business life as it proved effective. It was largely due to this perfect teamplay that the problem of the nation to marshall its resources and applied powers swiftly and irresistibly against the common enemy was accomplished. In the attainment of that end, obstacles practically without precedent were overcome, confusion incident to the shaping of a war machine of unparalleled magnitude gradually were resolved into order and industry finally was so related that it functioned on a truly national basis. Victory, won, not the least of the great truths to be drawn from the year and from the experience of the war has been the tremendous momentum possible to a sympathetic, purposeful union of government and business in this country.

War Demands Grow Tremendously

THE upward curve of the nation's tremendous war effort is traced appropriately by the expanding demands in steel sought by the government in behalf of essential industry. As the year advanced and new requirements of steel for military enterprises of this country and the allies began to compound it became clearly apparent that all previous expectations and estimates were being far eclipsed. The vastness of the undertaking and the changing aspects of the war constantly created new and greater demands which could not be calculated and prepared for in advance. It was due to this ever-changing and always upward swing of war needs that drew the restrictions tighter and tighter upon normal industry and evolved constantly more drastic regulation of production and distribution.

It was in fact with surprise and astonishment that the iron and steelmakers of the country gathered at New York in May heard the steel director declare that the war situation had reached the point where 100 per cent of the current production must be assured the government. Up to the time of that historic meeting the iron and steel industry had been working more or less in the dark as to the exact extent of the government's necessities. It had been estimated at the close of the preceding year that probably 7,000,000 tons of primary war needs were in sight. At the May meeting the steel director showed that this total had been left far behind. In shell steel alone 5,000,000 tons was then called for. The prospective demands for plates, rails and other leading products were equally huge by comparison.

The producers having previously pledged themselves to devote 100 per cent of their capacity if required, to the nation's cause, then for the first time drew an adequate appreciation of their task. Later in the month the steel director, speaking before the American Iron and Steel institute in New York, definitely estimated the war orders for the government and its allies then on hand for delivery over the year were 16,800,000 tons. There still remained, nevertheless, in the minds of many buyers and sellers a conviction that in view of the country's great capacity, a liberal tonnage still would be available to general nonwar consumption. This view persisted until some months later, but it was never realized.

The ever-growing pressure for steel and the difficulties of maintaining full production of the mills and furnaces under the conditions of labor dislocation, shortage of traffic facilities and other causes led to the historic announcement of June 6 by the war industries board in which a voluntary agreement made with the government by the American Iron and Steel institute in behalf of the whole industry was set forth. In substance this document virtually placed the iron and steel industry under the complete supervision of the government both as to production and distribution. The producers pledged themselves that no pig iron or steel products would be shipped or delivered except in accordance with priority and preference regulations as determined by the proper authorities of the government. This agreement was carried out conscientiously and most effectively until the signing of the armistice freed the industry of practically all restrictions. In the interval war requirements of steel had continued to expand and at the conclusion of hostilities those in hand for delivery during the succeeding months were estimated at approximately 25,000,000 tons.

Normal Market is Suspended

IN the usual sense of the word, there was no market in iron and steel in 1918. A place awaited every

ton as fast as it came from the mills and furnaces and its distribution was regulated by the service it was able to render in war or essential industry. Fixed maximum levels kept prices within bound. Producers of direct and indirect war material satisfied their requirements largely through allocations placed in their behalf by government machinery, especially organized for that purpose. Out of this condition of demand far exceeding supply came the adoption of the system of priority in production and delivery. The elaborate machinery developed by the government for this purpose had its origin in the overwhelming demand for steel and the manufactures of steel. By far the greater part of its operation dealt with apportionment of steel supplies. Combined with this system a plan to promote conservation in manufacturing was effected. The results of this movement promise to outlast the war and to establish permanent economies and more enlightened methods in various lines of industry. The rationing system whereby various industries were allotted only a portion of their normal needs was put into effect widely. All of these efforts had a common end—the saving of vital tonnage for the urgent necessities of war. By these various means, the urgent demands of the United States and its allies were met promptly as they arose and no critical need went unsatisfied. The allies profited from this system equally with this country and they, especially Italy and France, were enabled to obtain large tonnages from American mills and furnaces.

The large shortage of output in pig iron during the initial months cast its influence over the market throughout the year. It led to increasing requests being made by those engaged in war contracts upon the government to obtain supplies for them until finally most of the metal being placed with the furnaces was through the allocation process. From May 1, until well in December when the allocating machinery was disbanded, 1,965,000 tons of iron had been obtained for consumers by this method. During the war period prior to May 1 the allocations were only about 50,000 tons.

A Year of Operating Difficulties

TOTAL statistics fail to tell the real story of the year's great achievement. The outputs of both iron and steel barely approximate the 1917 tonnages and were considerably less than in 1916. Pig iron production with coke and anthracite fuel was about 38,000,000 tons, while the steel works turned out something over 42,000,000 tons of ingots. These figures compare with 38,164,976 tons of iron and 42,200,000 tons of steel in 1917, and 39,019,123 tons of iron and 41,401,917 tons of ingots in 1916.

During the first quarter especially, the industry battled against unforeseen conditions that were alike the most trying, the most unusual and the most obstructive that had been faced in many years, if ever. These conditions chiefly concerned transportation and they represented a combination of inadequate railroad equipment and a winter of unprecedented severity. This crippling of the industry came at a time when the capacity of the iron and steel plants of the country was being drawn upon to meet tremendous demands in war material from the allies and from the rapidly developing military program of the United States. The loss in pig iron during January, February and March as a result of these factors was about 1,150,000 tons, compared with the first quarter of 1917, and 1,650,000 tons compared with a similar period in 1916. The aim and problem of producers were to retrieve this lost tonnage during the remaining nine months of the year. This task was accomplished on an ascending scale. The output of the last half of the year was the greatest for any six months in the nation's history. This record was attained despite the fact that in the final quarter, and with the allied drive at its height, operations again were repressed by the influenza epidemic. But for this fact, October would have marked the greatest month both as to daily rate and output ever known, which it missed by a comparatively slight margin. In September the largest daily rate of output of any single month on record was attained.

The movement of iron ore by lake for the season did not quite reach the record of the previous year. The total was 61,034,763 tons, compared with 62,498,901 tons in 1917, a decline of 1,464,138 tons. The tonnage moved in fact represented the full requirements of the furnaces for current operations and for the winter period, as gaged during the latter part of the season. At that time, 2,000,000 tons of ore contracted for was eliminated because it was not urgently needed.

General Trade Yields to War

WITH trade under control and subordinated to national needs, the year's foreign commerce in iron and steel suffered an inevitable shrinkage. During the first 10 months of 1918 exports aggregated 4,570,990 tons, compared with 5,310,762 tons for a similar period in 1917, and with 6,439,178 tons for the full calendar year of 1917. In 1916, the records were 4,912,439 tons for the 10 months, and 6,047,646 tons for the full year respectively. These outborne shipments did not include the tremendous tonnage which was carried overseas in various forms to the American expeditionary forces, the exact amount of which remains to be disclosed, but was a matter of several millions. In this connection, 1,000,000 tons of steel was borrowed by General Pershing from Great Britain during the early months in order to save shipping. This tonnage subsequently was repaid by American mills and furnaces. Imports of iron and steel in 1918 reached the relatively insignificant total of 124,345 tons up to November, compared with 293,137 tons for a like period in 1917.

Pig Iron Market Has Abnormal Year

Starting With Deficit in Output of 1,500,000 Tons, Furnaces Are Hard Put to Meet Critical Necessities—Allocations, Totalling 1,900,000 Tons Supplant Open Sales—Large Tonnage Furnished to Allies

UNBIASED historians will give America full credit for having saved the world to democracy; for having weighed down the balance against the forces of barbarism and reaction; for having provided the "punch" that made possible the glorious victory which has crowned the allied arms, but it may well be asked: Would American achievements have been possible if it had not been for the complete and wholehearted cooperation of industry in the aims and efforts of the government? And in no American industry has this cooperation and subordination of individual interests to the will of the government been so nearly 100 per cent as in the American iron industry. Thoughts of profits have been submerged by a wave of patriotism; what the government has decreed as a fair price for iron, producers have cheerfully accepted; where the government believed supplies would best serve the aims and objects of the war program, there the iron has gone. If there had been no suspension of the law of supply and demand, very much higher prices undoubtedly would have prevailed and the profits of the iron producer would have been vastly enhanced. Moreover, in giving the government first call on production, the wants of the regular trade were neglected and shunted one side, so that today at the dawn of peace and after 14 months of government control there still remain on the books of the iron producers orders that bear some pretty old datings. It has been the common practice of the iron interests, especially during the last half of the year to take no orders that did not embody a contract provision that delivery was subject to delay in the event that the government saw fit to designate the tonnage for some more pressing need. Where the government did not take any direct part in the transaction, iron makers took it upon themselves to make sure that the buyer was sufficiently engaged on war work or that the metal would find a war or essential use before completing a sale. Not a case has been known where a member of the iron industry has gone contrary to any wish of the government as promulgated through the war industries board.

Fixed Maximum Prices

At Furnace

Jan. 1 to April 1	
No. 2 foundry	$33.00
Basic	33.00
Bessemer	36.30
Malleable	33.50
Lake Superior Charcoal	35.50
April 1 to Oct. 1	
No. 2 foundry	$33.00
Basic	32.00
Bessemer	35.20
Malleable	33.50
Lake Superior Charcoal	35.50
Oct. 1 to Jan. 1	
No. 2 foundry	$34.00
Basic	33.00
Bessemer	35.20
Malleable	34.50
Lake Superior Charcoal	36.50

New basing points for eastern, Virginia, Tennessee and certain other districts.

As a trading proposition the year 1918 will go on record as one of extreme tameness, for there was always waiting a hungry and insistent demand which rendered skilled salesmanship unnecessary. All competition was removed by maximum prices which by common agreement could not be exceeded, but which at the same time were low enough from the standpoint of profit to prevent shading. Iron actually sold itself and at all times during the 12 months, except possibly in the last month of the year, it was the buyer who sought the seller.

The year opened with the furnaces practically 100 per cent sold against production for the first half of the year. But considerable time elapsed before deliveries against these contracts made much headway. For January saw the most serious shortage of fuel in the history of the industry, resulting in a marked curtailment of production, while the severity of the weather brought on the most deplorable transportation situation the country ever experienced and shipments were subjected to long and tedious delays resulting from the attendant congestion along all rail arteries. It is estimated that normal output was reduced by 1,500,000 tons by the upset operating conditions in January and February. It was well along toward spring before there was any marked improvement in the situation either with regard to fuel

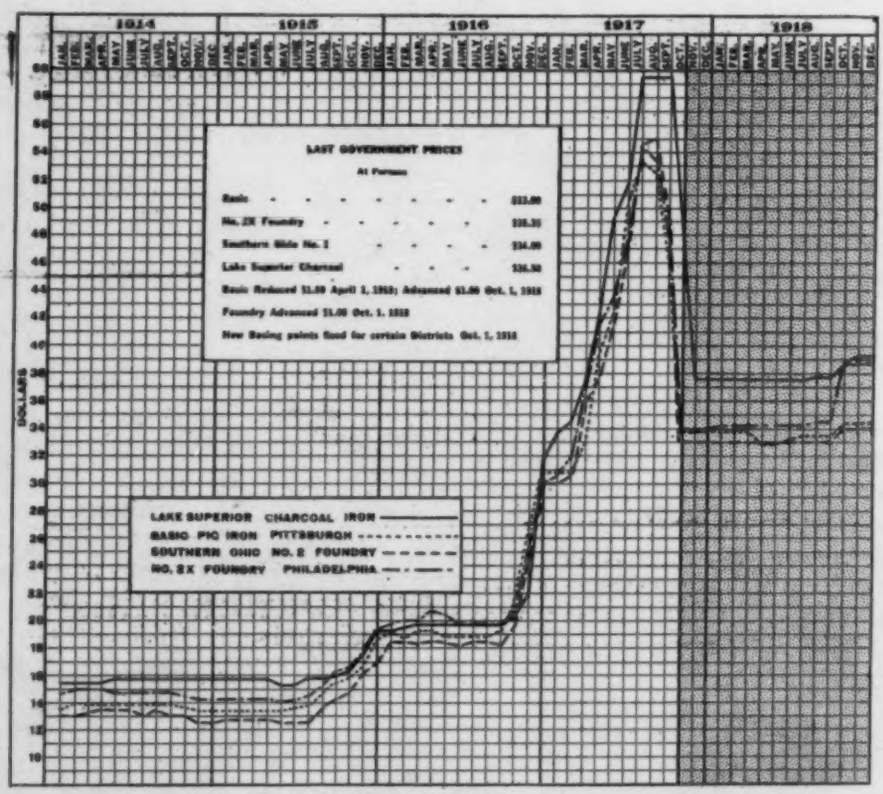
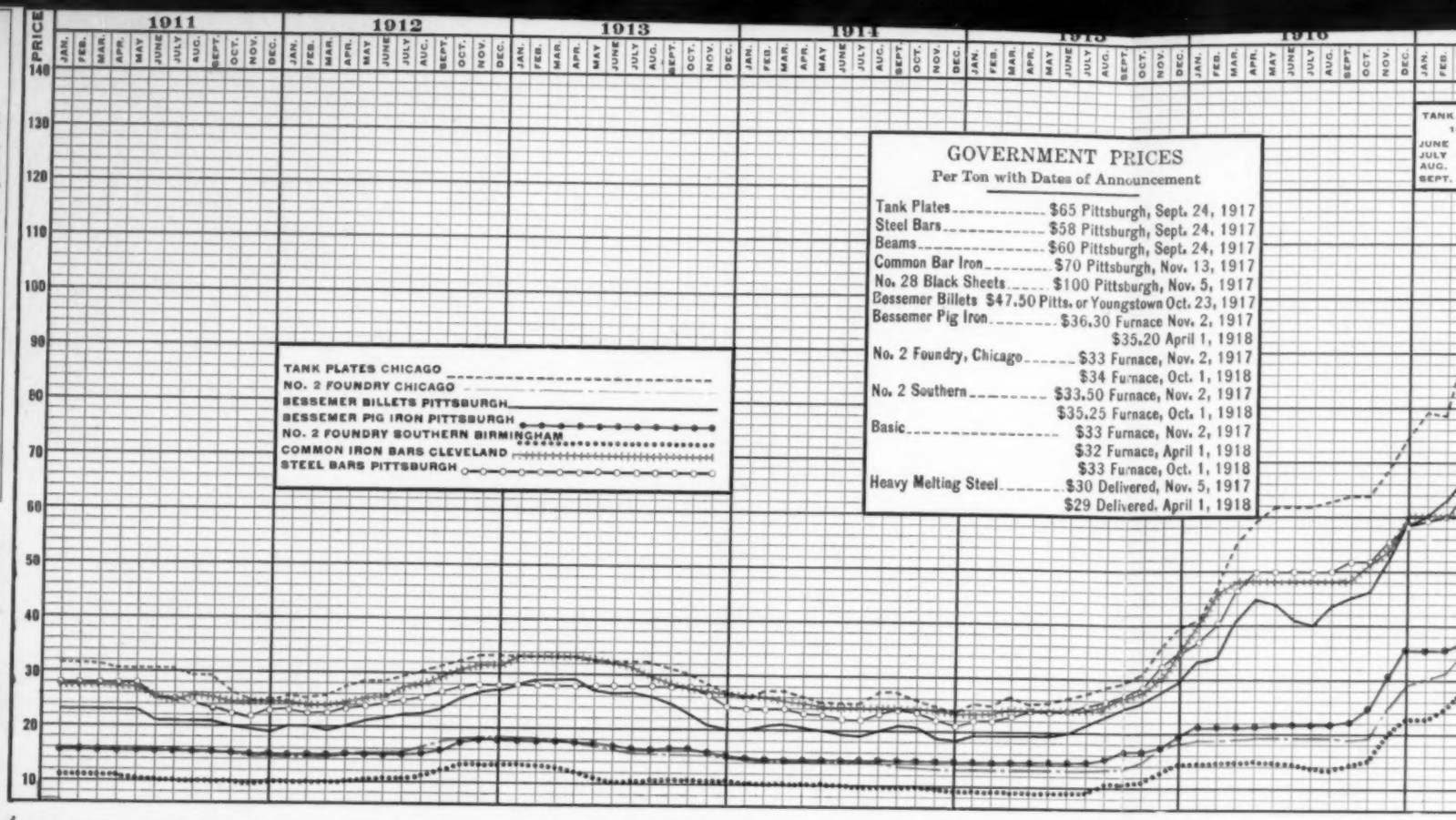


CHART OF PRICES FOUR LEADING GRADES, 1914-1918. SHADED PORTION SHOWS PERIOD OF GOVERNMENT CONTROL

FINISHED PRODUCTS IN NET TONS
PIG IRON AND BILLETS IN GROSS TONS

Tables of Prices on which these Charts are based are published in THE IRON TRADE REVIEW, of Jan. 2, 1919

THE IRON TRADE REVIEW



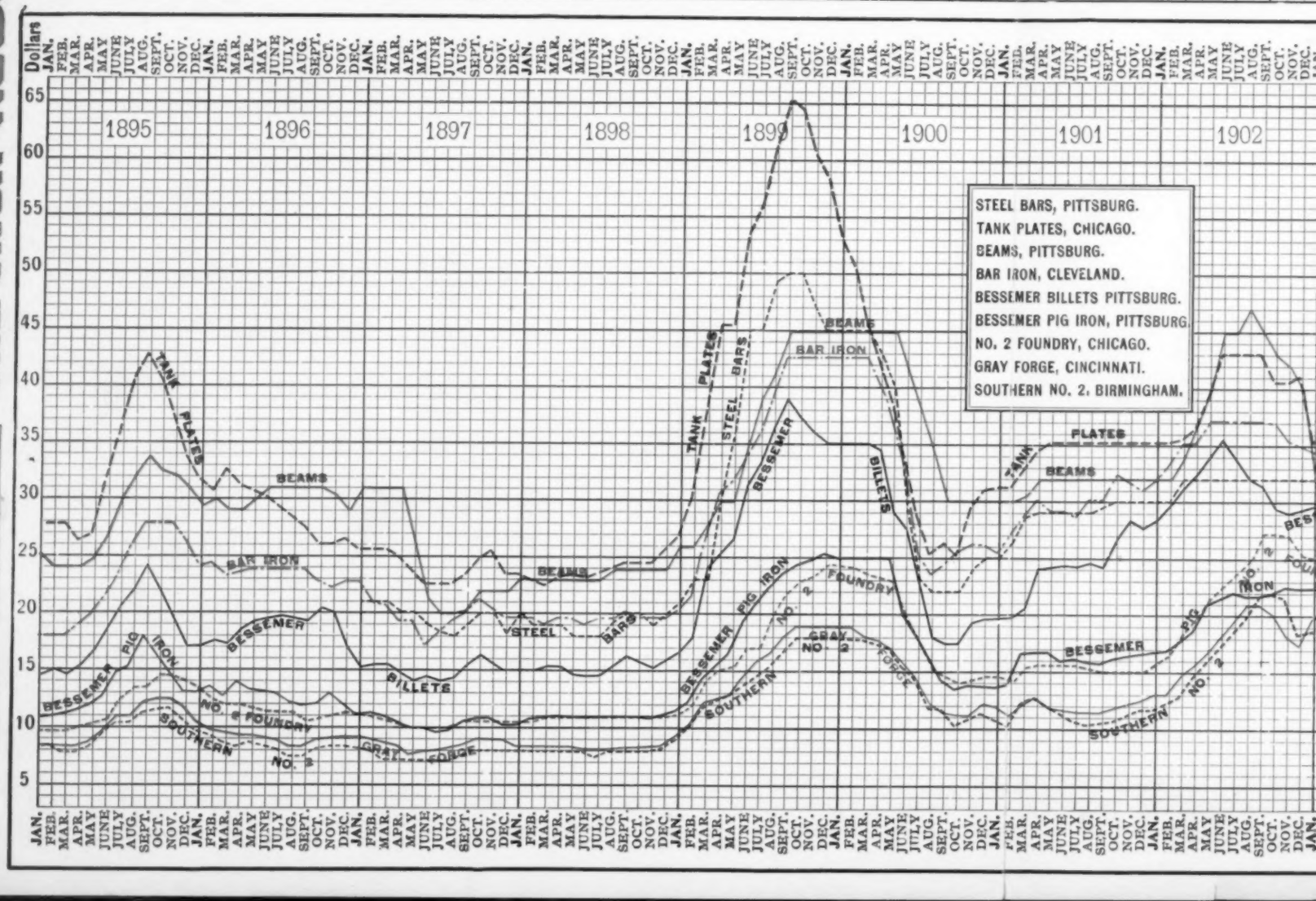
GOVERNMENT PRICES

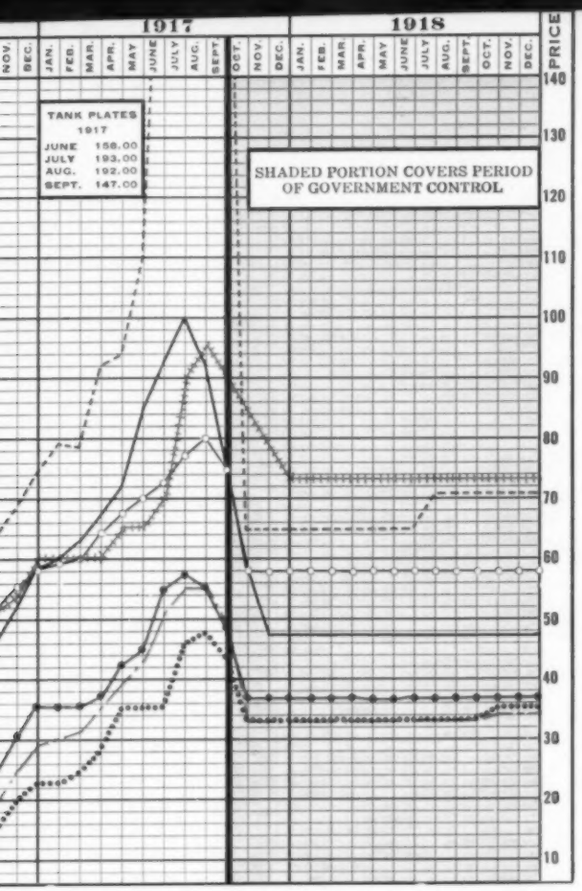
Per Ton with Dates of Announcement

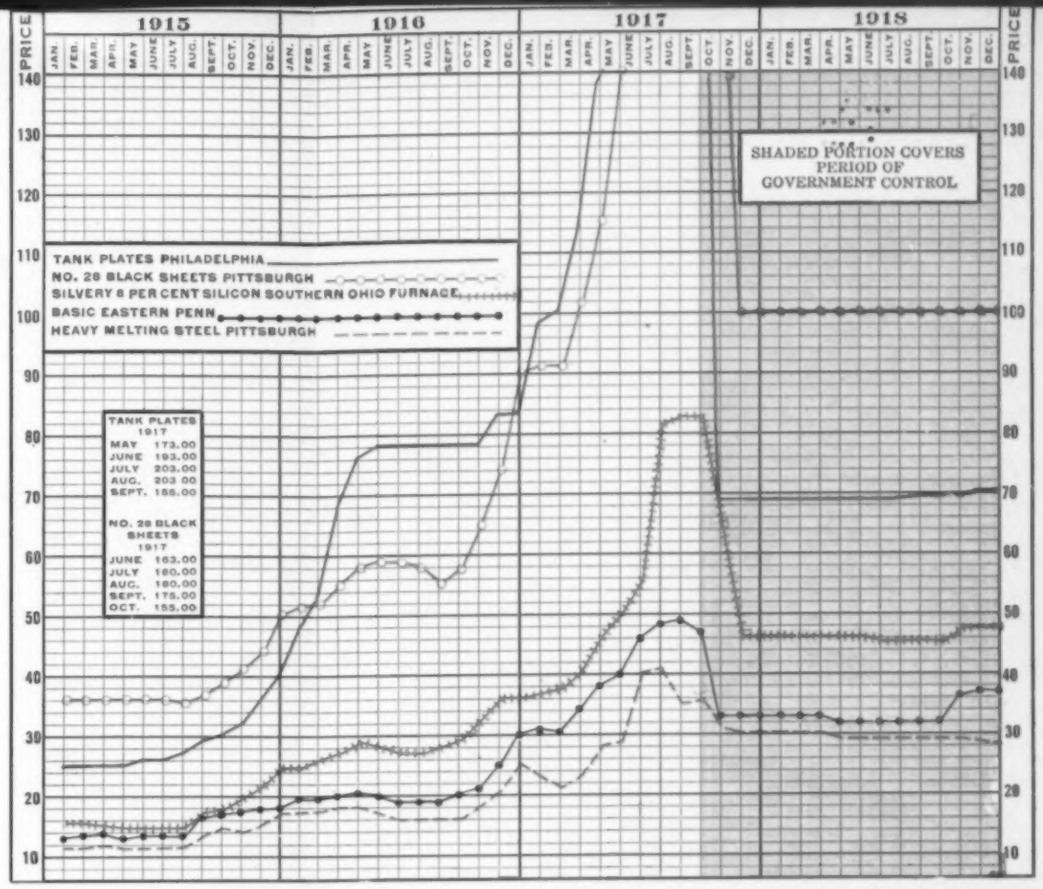
Tank Plates	$65 Pittsburgh, Sept. 24, 1917
Steel Bars	$58 Pittsburgh, Sept. 24, 1917
Beams	$60 Pittsburgh, Sept. 24, 1917
Common Bar Iron	$70 Pittsburgh, Nov. 13, 1917
No. 28 Black Sheets	$100 Pittsburgh, Nov. 5, 1917
Bessemer Billets	$47.50 Pitts. or Youngstown Oct. 23, 1917
Bessemer Pig Iron	$36.30 Furnace Nov. 2, 1917
	$35.20 April 1, 1918
No. 2 Foundry, Chicago	$33 Furnace, Nov. 2, 1917
	$34 Furnace, Oct. 1, 1918
No. 2 Southern	$33.50 Furnace, Nov. 2, 1917
	$35.25 Furnace, Oct. 1, 1918
Basic	$33 Furnace, Nov. 2, 1917
	$32 Furnace, April 1, 1918
	$33 Furnace, Oct. 1, 1918
Heavy Melting Steel	$30 Delivered, Nov. 5, 1917
	$29 Delivered, April 1, 1918

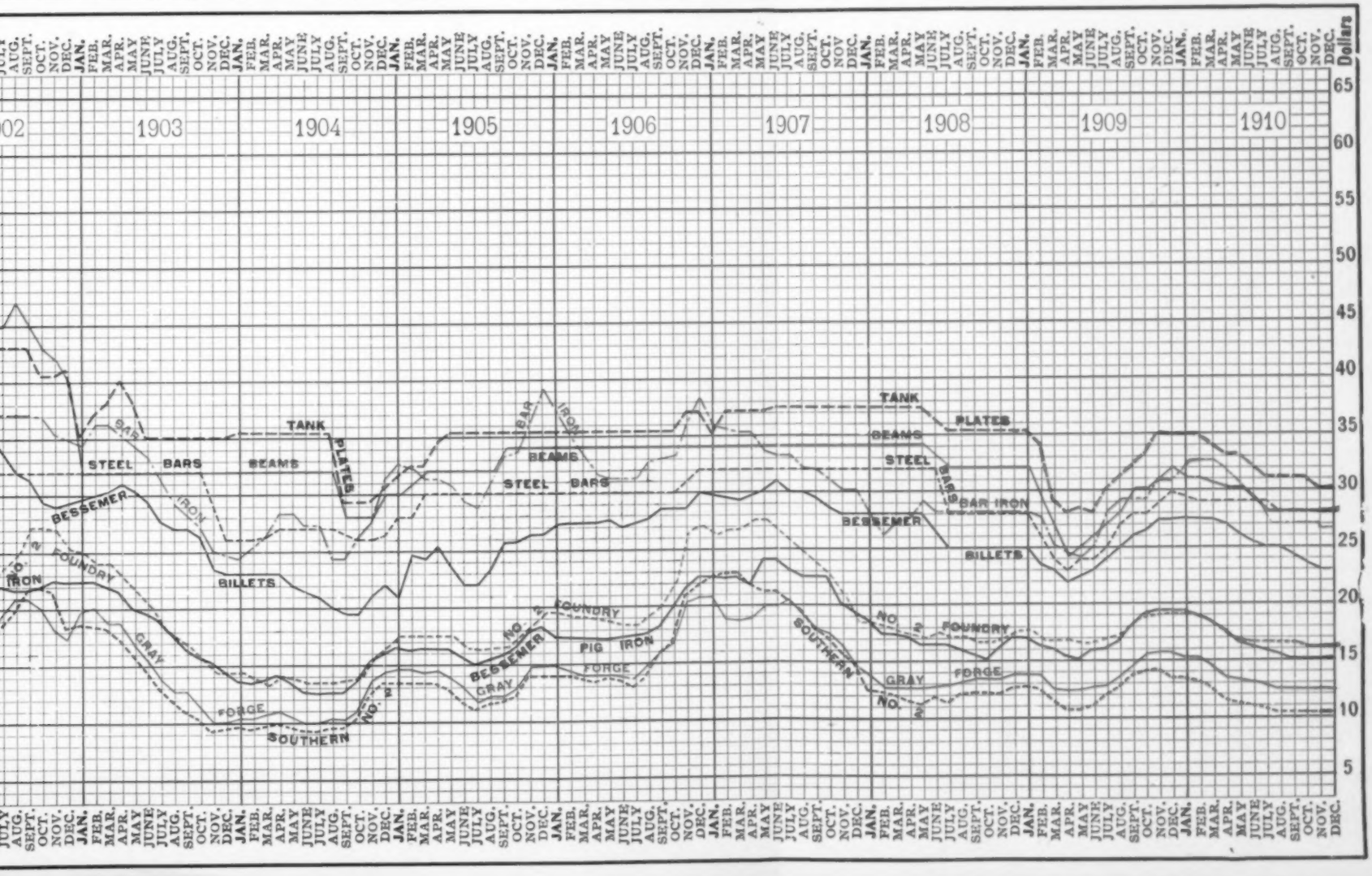
FLUCTUATIONS IN IRON AND STEEL PRICES FOR TWENTY-FOUR YEARS

Supplement to the issue of Jan. 2, 1919 THE IRON TRADE REVIEW




1917
1918
PRICE
TANK PLATES
1917
JUNE 158.00
JULY 193.00
AUG. 192.00
SEPT. 147.00
SHADED PORTION COVERS PERIOD OF GOVERNMENT CONTROL


1915
1916
1917
1918
PRICE
TANK PLATES PHILADELPHIA
NO. 28 BLACK SHEETS PITTSBURGH
SILVERY 8 PER CENT SILICON SOUTHERN OHIO FURNACE
BASIC EASTERN PENN
HEAVY MELTING STEEL PITTSBURGH
TANK PLATES
1917
MAY 173.00
JUNE 193.00
JULY 203.00
AUG. 203 00
SEPT. 186.00
NO. 28 BLACK SHEETS
1917
JUNE 163.00
JULY 180.00
AUG. 180.00
SEPT. 175.00
OCT. 155.00
SHADED PORTION COVERS PERIOD OF GOVERNMENT CONTROL


1902
1903
1904
1905
1906
1907
1908
1909
1910
Dollars
TANK PLATES
BEAMS
STEEL BARS
BAR IRON
BILLETS
BESSEMER
FOUNDRY
GRAY FORGE
PIG IRON
SOUTHERN

supplies or to transportation facilities.

Business at the outset of the year was hampered seriously not only by the uncertainties surrounding production and delivery, but also by the confusion which existed among producers with regard to prices and as to how far they might go in booking orders and yet conform to the desires of the government. Price regulation then was still in the early stage and when the government announced that all deliveries after April 1, would be at the price established by the government, producers floundered for a time as to the proper course to pursue. With the digestion of the ruling and a clearer understanding of its intents, business went forward again actively and the end of February saw most of the last half of 1919 production under contract.

There was little free iron for the remainder of the year and the function of producers merely was to produce and to ship against contracts, though after the first quarter of the year, the demand for steelmaking iron became so great and so insistent that numerous stacks which had been producing foundry and forge grades went over to basic and bessemer and suspended activities on the orders they had booked. Not only did the government begin to take a more pronounced stand in the matter of production at this time, but followed it up by assuming, with the full consent of the industry, more active control of distribution. It was becoming evident then that the iron production of the country would not be sufficient for the requirements of both the war machine and of those consumers of iron not engaged in the production of lines essential to the successful prosecution of the war

As the determination to win the war waxed stronger it became apparent that the attainment of this end was being hampered by the fact that too much iron was going to the so-called nonessential industries. Iron that it might have contracted for was diverted to consumers who would put it to the best uses from the standpoint of the government. It became necessary for these nonessential consumers of iron to engage in government work to at least 50 per cent of capacity to secure shipments.

Government allocation of steel ceased on Nov. 30. The necessity of its securing supplies of iron virtually ended when the armistice was signed on Nov. 11, although allotments continued to be made for certain government needs, such as for the Emergency Fleet corporation, the railroad and the food administrations for some days after that date. Figures com-

Prices of Representative Grades of Pig Iron

1914-1918

BASIC, PITTSBURGH

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1918	$33.95	$33.95	$33.95	$32.95	$32.95	$33.20	$33.40	$33.40	$33.40	$34.40	$34.40	$34.40
1917	30.95	30.95	32.85	39.20	42.15	50.20	53.20	52.75	43.95	33.95	33.95	33.95
1916	19.20	18.77	19.20	19.20	18.95	18.95	18.95	18.95	19.08	20.83	25.95	30.95
1915	13.45	13.45	13.45	13.45	13.45	13.54	13.83	14.89	15.65	15.95	16.70	18.55
1914	13.42	14.09	13.96	13.90	13.90	13.90	13.90	13.90	13.90	13.75	13.45	13.45

BESSEMER, PITTSBURGH

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1918	$37.25	$37.25	$37.25	$36.15	$36.15	$36.40	$36.60	$36.60	$36.60	$36.60	$36.60	$36.60
1917	35.95	35.95	37.45	42.20	44.95	55.20	57.95	55.55	48.27	37.25	37.25	37.25
1916	21.32	21.45	21.55	21.95	21.95	21.95	21.95	21.95	22.20	24.33	30.35	35.95
1915	14.70	14.63	14.55	14.55	14.55	14.58	14.88	15.89	16.80	16.95	17.45	19.70
1914	15.00	15.09	15.15	14.90	14.90	14.90	14.90	14.90	14.90	14.85	14.70	14.70

NO. 2X FOUNDRY, PHILADELPHIA

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1918	$34.25	$34.25	$34.25	$34.25	$34.25	$34.25	$34.50	$34.50	$34.50	$38.85	$39.15	$39.15
1917	30.50	31.75	36.90	41.75	43.35	47.50	54.35	53.40	47.80	34.00	34.00	34.00
1916	19.75	20.00	20.00	20.75	20.50	19.75	19.75	19.75	19.75	20.50	25.25	30.00
1915	14.25	14.25	14.25	14.25	14.00	14.25	14.50	15.25	16.25	16.50	17.50	19.25
1914	14.75	15.00	15.00	15.00	14.75	14.75	14.75	14.75	14.75	14.50	14.25	14.25

SOUTHERN OHIO NO. 2 FOUNDRY, IRONTON

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1918	$33.00	$33.00	$33.00	$33.00	$33.00	$33.00	$33.00	$33.00	$33.00	$34.00	$34.00	$34.00
1917	30.00	30.75	35.80	37.75	41.20	47.50	54.50	55.00	49.25	33.00	33.00	33.00
1916	18.30	18.50	18.30	18.50	18.50	18.15	18.44	18.40	18.13	19.38	24.00	30.00
1915	12.75	12.75	12.75	12.75	12.56	12.50	12.60	13.63	14.20	14.88	16.13	17.00
1914	13.00	13.00	13.25	13.50	13.50	13.50	13.00	13.50	13.00	13.00	12.63	12.63

LAKE SUPERIOR CHARCOAL IRON, CHICAGO

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1918	$37.50	$37.50	$37.50	$37.50	$37.50	$37.50	$37.70	$37.70	$37.70	$38.70	$38.70	$38.70
1917	33.75	34.50	37.55	42.25	49.25	51.80	59.50	59.50	59.50	48.50	37.50	37.50
1916	19.25	19.50	19.75	19.75	19.75	19.75	19.75	19.75	19.75	20.35	21.95	31.75
1915	15.75	15.75	15.75	15.75	15.25	15.25	15.75	15.75	15.95	16.25	17.50	19.25
1914	15.50	15.50	15.50	15.50	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75

STANDARD LOW PHOSPHORUS, PHILADELPHIA

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1918	$55.50	$55.50	$55.50	$55.50	$55.50	$55.50	$56.00	$56.00	$56.00	$57.00	$57.00	$57.00
1917	54.50	57.50	66.70	75.50	77.00	85.00	92.50	92.50	82.00	55.50	55.50	55.50
1916	54.50	57.50	66.70	75.50	34.00	34.00	33.00	33.00	34.00	40.00	46.00	55.00
1915	19.00	19.00	20.00	20.00	20.00	20.50	21.50	23.50	24.50	28.00	30.00	32.00
1914	21.00	21.00	21.00	21.00	21.00	20.50	20.50	21.00	21.00	21.00	19.00	19.00

BASIC EASTERN PENNSYLVANIA

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1918	$33.90	$33.90	$33.90	$32.90	$32.90	$32.90	$32.90	$32.90	$32.90	$36.60	$36.90	$36.90
1917	30.15	30.50	33.80	38.25	40.80	46.40	50.75	51.00	46.50	33.50	33.50	33.50
1916	19.50	19.50	20.00	20.50	20.00	19.25	19.00	19.25	20.00	21.00	25.50	30.50
1915	13.50	13.75	14.00	13.25	13.50	13.50	13.75	15.25	17.25	17.50	17.75	18.00
1914	14.00	14.25	14.25	14.25	14.00	14.00	14.00	14.00	14.00	14.00	13.50	13.50

VIRGINIA NO. 2X FURNACE

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1918	$33.50	$33.50	$33.50	$33.50	$33.50	$33.50	$33.50	$33.50	$33.50	$37.50	$38.00	$38.00
1917	26.50	28.25	34.25	38.40	41.00	46.50	52.25	51.90	46.50	33.50	33.50	33.50
1916	17.25	18.00	18.25	18.50	18.50	18.50	18.50	18.50	17.50	18.50	23.75	27.00
1915	12.50	12.50	12.50	12.50	12.50	12.50	12.50	13.00	13.50	14.00	15.50	17.00
1914	12.75	12.75	12.75	12.75	12.50	12.50	12.50	12.50	12.50	12.50	12.50	12.50

SOUTHERN NO. 2, BIRMINGHAM

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1918	$33.50	$33.50	$33.50	$33.50	$33.50	$33.50	$33.50	$33.50	$33.50	$35.25	$35.25	$35.25
1917	23.00	24.50	28.00	35.80	35.75	35.75	46.00	48.00	43.50	33.50	33.50	33.50
1916	14.50	14.65	15.00	15.00	15.00	14.45	14.00	13.60	14.40	15.15	19.60	23.00
1915	9.50	9.50	9.40	9.35	9.75	9.55	9.60	11.00	11.30	11.75	13.15	14.20
1914	10.50	10.50	10.60	10.50	10.50	10.45	10.05	10.00	10.00	10.00	9.90	9.50

piled by the committee of the American Iron and Steel institute having this matter in charge show that roughly about 1,900,000 tons were allocated, or somewhat less than 20 per cent of the year's total production of merchant stacks. Included in the allocations were foreign as well as domestic requirements, among foreign allocations being one for 180,000 tons for Great Britain, 100,000 tons being furnished by Northern producers and the remainder by Southern stacks. When the armistice was signed Great Britain was negotiating for 750,000 tons of basic iron for November-December and all 1919 delivery. This was the largest single inquiry ever put before American producers. This inquiry has never been settled though Great Britain remains a receptive buyer of a large tonnage. Late in the year 100,000 tons was allocated for Italy and throughout the year large lots were placed for that country and France. These were of practically all grades.

Production Under Previous Years

If the 1918 iron production goes much above 37,000,000 tons, it will have exceeded expectations. The loss sustained during January and February was too great to be physically possible of recovery. Especially was this true because it was well along in the year before several stacks could be brought back in shape to give the best results after the heavy strains to which they were subjected during the latter part of 1917.

Merchant iron production for the first half of 1919, according to an estimate presented at the November meeting of the American Pig Iron association at Cleveland, had been 80 per cent sold. The industry therefore, may be said to be starting off the new year in comfortable shape with regard to immediate business. Some curiosity exists in some quarters however as to the amount of metal included in this estimate which has been ordered against government steel orders cancelled since the signing of the armistice.

Producers, however, at the close of the year were not allowing consideration of this matter to worry them. A disposition was apparent on the part of foreign governments to secure the equivalent in commercial steel of the war material on which orders were cancelled. While the domestic demand for steel is held up more or less by the uncertainties surrounding the period through which the industry is passing, there are a few steel consuming industries, notably the manufacture of automobiles, that are making strong efforts to get back to a peace basis as quickly as possible.

It was figured not long ago that there was a deficit in the probable supply of pig iron of between 4,000,000 and 6,000,000 tons. This estimate was based on indicated iron production and the probable amount of steel that would be required in carrying forward the government's war program. To have fulfilled the war program in its entirety would have meant the absolute cutting off of iron and steel for ordinary purposes. To a large extent, the ordinary channels of iron consumption had been blocked off and now that they are reopened, they are expected to absorb much of the released tonnage.

Cancellation of Allocations Refused

A considerable portion of government steel requirements was ordered against iron that did not exist; hence, this theoretical deficit in the supply of between 4,000,000 and 6,000,000 tons. Cancellations involving this amount of iron still would leave the supply and demand equal. Another encouraging condition from the viewpoint of the merchant iron maker is that the great preponderance of his customers can use the iron they have ordered whether the demands are for peace or war. In other words, a great many melters have iron bought of the grade or kind they ordinarily would use.

The end of the war and the suspension of work on government orders has led some who started essential work at a late date and had iron allocated, to seek the annulment of these allocations on the ground that they would not need the iron. Blast furnace interests who took such business and who have been appealed to by these buyers for a release have directed them to Washington. Although the government did not buy the iron, it was largely responsible for its placing and the makers believe they should not be asked to cancel except by the government. Washington has held the matter should be adjusted by buyers and sellers, in the ordinary commercial fashion where a direct contract exists, and the government cannot be considered a party to the transaction.

Price Changes Few and Slight

Changes in iron prices during the year have been few and slight. For the first quarter the quotations established Sept. 24, 1917, were reaffirmed without change. A cut of $1 a ton in basic and of $1.10 in bessemer was announced for the second quarter, beginning April 1, in explanation for which Judge Gary said "the price on steelmaking iron was reduced because it was believed this product could reasonably afford a reduction, but more particularly because the reduction would be of considerable benefit to the makers of which material who are compelled to buy their melting material." Merchant producers, however, did not share this sentiment and while the protests against the cut were not strong enough to bring a change in the quarter beginning July 1, the demand for steel had become so tremendous and so urgent that an advance of $1 a ton was made in basic iron, for the last quarter of the year. Foundry iron also was lifted $1 a ton, but bessemer was left unchanged.

A further concession was granted by the government at this time in the matter of differentials by the establishment of basing points for certain districts. The object was to bring into and hold in production stacks which it was set forth could not operate profitably at the previous prices. Increased ore, labor and freight costs also were considered in this increase. Those gaining by the advance were the furnaces located in the south, in Virginia and in eastern Pennsylvania; Pittsburgh and valley interests lost rather than benefited by the raise.

Basing Point Changed

It was provided that effective Oct. 1, iron produced in Virginia, Tennessee and Birmingham districts and the scattering districts south of the Ohio and Potomac rivers, including furnaces at St. Louis, Mo., but not including furnaces bordering on the Ohio river, should be sold on an f.o.b. Birmingham, Ala., basis; that pig iron produced in the eastern districts, i.e., from all blast furnaces located east of the Allegheny mountains and north of the Potomac river, should be sold on an f.o.b. Pittsburgh basis; pig iron from all other producing districts or furnaces continues to be sold f.o.b. furnace, as heretofore. This change of basing point benefited some eastern iron makers as much as $2.50 a ton besides the $1 a ton advance allowed in the price. Virginia furnaces profited $3.50 to $4 per ton from the combined advance.

The year's range has been as follows: No. 2 foundry, $34 for a high and $33 for a low; basic, $33 high and $32 low; bessemer, $36.30 high and $35.20 low. In view of the fact that government control of prices ceased with the end of the year, it will be interesting to remember that the final government prices were $34 for No. 2 foundry, $33 for basic and $35.20 for bessemer.

By-Product Coke Outstrips Beehive

War Gives Great Impetus to Output by More Modern Method—Connellsville Production Fails to Reach Desired Mark—Labor Inefficiency, Lack of Car Supplies and Operating Difficulties Leave Mark on Year

PRODUCTION of by-product coke in 1918 not only caught up with, but passed behive output. The leadership of the by-product over the beehive method of manufacture in this country which has been plainly forecasted for years, thereby was established. In view of the fact that annually, millions of dollars worth of useful products are blown to the winds, it would seem that the saving of this vast amount will impell an ever increasing concentration of coking operations in the by-product plants. How the beehive ovens will be eliminated without hampering the operations of the merchant blast furnaces is a problem that is yet to be solved. It may be that the steel companies, which more and more are producing their own coke, some day will be commercial producers and supply the demand now being met by the beehive ovens.

Whatever the method, however, it is patent that the beehive oven has a comparatively few years of usefulness ahead and that from now on the coking regions will ship more and more raw coal, with an attendant decline in coke deliveries. It is fortunate for the country that it was not forced to depend entirely on the behive ovens last year for the fuel requirements of the nation at war, it may be said with perfect truth, never would have been met. For coal production did not attain potential possibilities and to have coked it all in beehive ovens would have involved an even greater strain on the output in view of the fact that the percentage yield of coke from a ton of coal runs better than 70 per cent in the by-product oven as against about 60 per cent in the older type of oven.

Fixed Maximum Prices

At Ovens East of Mississippi

48-hour furnace or smelting	$6.00
72-hour selected	7.00

Assuming that the 1918 production of coke ran up to about that of 1917, or in round numbers about 56,000,000 net tons and that there was an equal division of the output of the two types of ovens, the 28,000,000 tons made in the by-product oven on a basis of a 70 per cent yield would have been secured from 36,400,000 tons of coal, as against 39,200,000 tons that would have been consumed to net a similar amount of behive coke. Since the by-product ovens probably averaged a higher yield than 70 per cent and the beehive ovens were under rather than over 60 per cent, the saving in coal undoubtedly was larger even than these figures indicate.

Coke supplies in 1917 were largely a matter of cars. For the first quarter of 1918, transportation facilities continued the dominating factor. This difficulty, however, was solved fairly early in the year, only to be followed by an even more perplexing problem, that of labor. Although, the blast furnaces throughout the spring and summer and well into the fall obtained a sufficient supply of coke, they never had too much and it was only as a result of careful piecing out and distribution by the fuel administration that some consuming district did not suffer seriously for want of supplies. Seemingly, no amount of cajoling, pleading and appeals to the workmen could bring them to a realization of the important part they had been assigned to in the war drama, nor were the highest wages ever known a stimulus to coke production. That is in the regions where coke is made right at the coal mines.

In the week ended Sept. 14, the *Connellsville Courier* reported a coke production of 348,330 tons and, including as it did the Labor Day holiday, fond hopes were entertained that the men at last were beginning to heed the appeals to patriotism and that the mark of a total coal and coke production of 800,000 tons for one week,

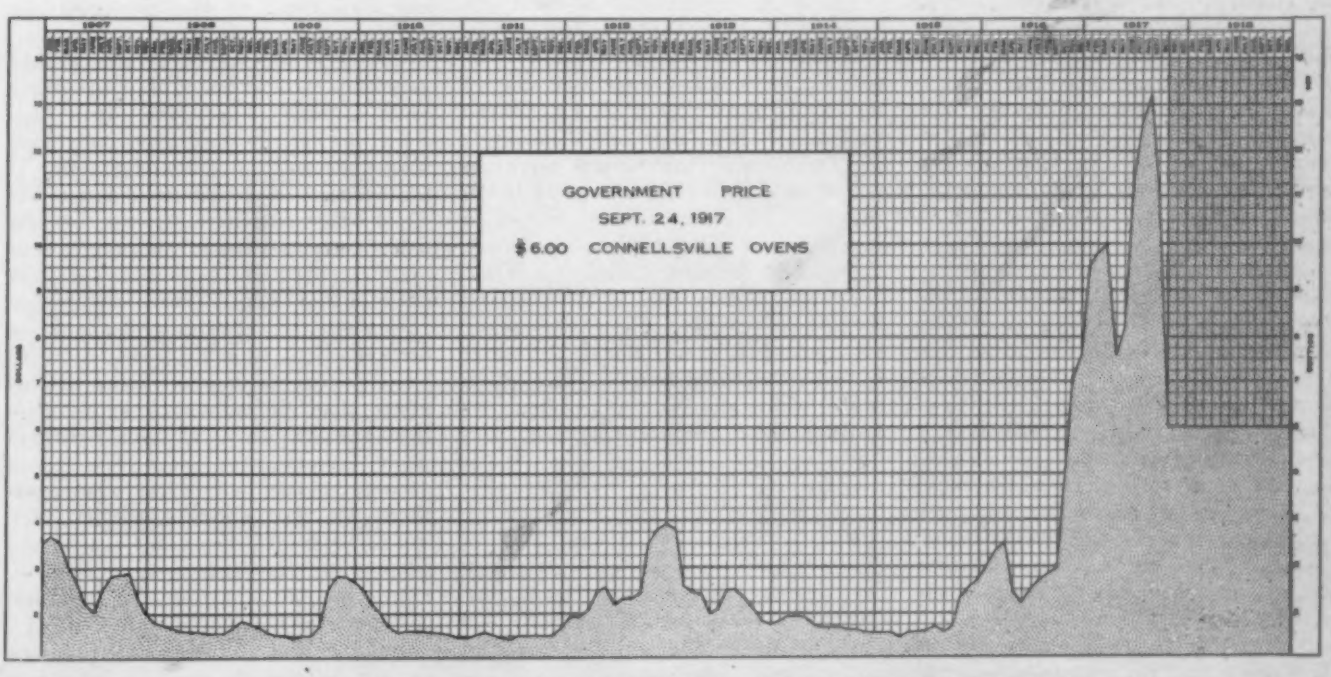


CHART OF AVERAGE MONTHLY PRICES AT OVENS OF CONNELLSVILLE FURNACE COKE 1907-1918

which the fuel administration had set out to achieve was at hand. The week of Sept. 14, however, proved to be the best week the region had during the year and thereafter there was almost constant decline in the coke output. When the influenza epidemic hit the region, the falling off in production took an almost perpendicular slant.

Labor was far from plenty throughout the year in the region, but the shortage was not so great as to be termed acute. The trouble with it was that it was inefficient. High wages, instead of proving a spur to efforts actually seemed to make the men indolent. It was only with the greatest difficulty and constant prodding that they were kept on the job the full six working days of the week.

There were some extenuating circumstances as to the region's showing. The influenza epidemic and the depletion it caused in the working forces was something that could not be prevented. Then again, as the Clairton by-product plant of the Carnegie Steel Co. came into operation, the coal that had previously gone to several thousand beehive ovens of the Frick Coke Co. was diverted to the Clairton plant and the fires withdrawn from the beehive ovens. Expansion of steel plant by-product capacity drew from the coal producing regions, among them the Connellsville, huge tonnages of coking coal.

Chaotic conditions prevailed in the coke situation at the outset of the year. Connellsville traffic conditions were described as the worst in the history of the industry. On the tracks of the railroads serving the district early in January were 5000 loaded cars, some of which had been standing for four to five days, because railroad crews were scarce and the efficiency of the motive power badly impaired by severe weather. Various plans were considered for helping the situation, but little headway was made, for while one plan, the elimination of cross hauls on the railroads, worked well, the weather was always an upsetting factor. There were suggestions of the pooling of supply to insure an equitable distribution, but this was opposed on the ground that it would mean shipments to some plants of a grade that could not be used.

This pooling arrangement was abandoned, revived, but finally dropped entirely. The car supply during the first two months of the year usually hovered between 30 and 50 per cent, but at times rose much higher. Bringing of equipment from the east helped some, but distribution remained uneven and along about the end of February, the fuel administration commandeered in excess of 20,000 tons monthly for the Midvale Steel & Ordnance Co. and about 10,000 tons monthly for the Eastern Steel Co., Pottstown, Pa., which were not getting sufficient supplies. Diversion of 30,000 tons monthly to eastern Pennsylvania consumers from a Connellsville operator was ordered by the authorities about the middle of March.

Meanwhile, conditions in other parts of the country were not much better. Chicago could not get coal for the steel by-product plants there and early January saw 15 of the 23 stacks of the Illinois Steel Co. banked because of that condition. Cincinnati, St. Louis and Birmingham were no better off and in February, Cincinnati was shut off from normal sources of supply for a time by washing away of railroad bridges across the Ohio river by an overflow. New England seemed to escape, for fairly heavy coal supplies came along by water and the requirements of this region easily were met by the leading by-product coke producers in that section.

Conditions Change

Matters began to mend late in March, but it was not until about the first of May that transportation conditions became really normal and soon thereafter the plans of the fuel and railroad administration began to unfold. Zones were established whereby consuming regions were supplied from the most convenient producing section. This practically entirely eliminated cross hauls and went a long way toward keeping all consuming districts provided. Once the zoning system was in effect, it was not long before the fuel administration took over more complete direction of supplies.

Connellsville producers opened the year with their output for the first half of 1918 contracted for. Outside of a few diversions ordered to meet the shortages in eastern Pennsylvania, these contracts were fulfilled. Contracting for the second half got away slowly, for while not openly discouraging the practice, the fuel authorities made it plain that the distribution was to be made in no way that should interfere with the war program. Contracting was resumed later, but the existence of contracts did not stand in the way of diversions of shipments later, for there cropped out requirements which the fuel administration deemed to be more pressing than those of the holder of the contract.

Contracts for first half furnace coke generally were at $8, $9 or more a ton f.o.b. ovens. The government had fixed the price of Connellsville furnace coke at $6, ovens and foundry at $7, ovens. These prices did not become effective generally until the first half contracts expired and the benefit of the reduction to consumers was slight being largely eaten up by an advance in freight rates. The $1 a ton premium on foundry coke tempted some producers to make more of this grade than of furnace coke. While furnace coke has at no time been too plenty, there have been few times during the last half of the year when there was not enough foundry fuel.

The end of the year found the supply of furnace coke decidedly scarce but with heating and domestic coke in ample, if not plentiful, supply. Signing of the armistice was followed by the lifting of practically all war

Connellsville, Virginia and West Virginia Coke Prices

AVERAGE MONTHLY PRICES FOR YEAR 1918

	Wise County		Pocahontas		New River		Connellsville	
	Furnace	Foundry	Furnace	Foundry	Furnace	Foundry	Furnace	Foundry
January	$6.00	$7.00	$6.00	$7.00	$6.20	$6.80	$6.00	$7.00
February	6.00	7.00	6.00	7.00	6.00	7.00	6.00	7.00
March	6.00	7.00	7.35	8.00	7.00	8.00	6.00	7.00
April	6.00	7.00	8.00	8.00	7.00	8.00	6.00	7.00
May	6.00	7.00	8.00	8.00	7.20	8.00	6.00	7.00
June	6.00	7.00	8.00	8.00	8.00	8.00	6.00	7.00
July	7.25	8.25	8.00	8.00	8.00	8.00	6.00	7.00
August	7.25	8.25	8.00	8.00	8.00	8.00	6.00	7.00
September	7.25	8.25	8.00	8.00	8.00	8.00	6.00	7.00
October	7.25	8.25	8.00	8.00	8.00	8.00	6.00	7.00
November	7.25	8.25	8.00	8.00	8.00	8.00	6.00	7.00
December	7.25	8.25	8.00	8.00	8.00	8.00	6.00	7.00

restrictions, save in the matter of prices. Some contracting for first half of 1919 deliveries had been done, but on the whole, producers start the new year with fairly clean books.

Some interpreted the Lever law to end with the proclamation of peace; others, not for six months after the official announcement. The feeling was fairly general that ending of government control of prices would be followed by a decline. Most contracts that were made were at the government price but some stipulated a fresh agreement was to be drawn up if government control ended, the buyer reserving the right to the tonnage as originally specified.

Tin Plate Makers Rise to All Demands

CONFIDENCE on the part of the manufacturers of tin plate in their ability to meet the tremendous demands put upon them, as expressed at the beginning of last year, events of the year prove, has been amply justified. Although production fell considerably below the theoretic capacity of the mills, which through the building of new mills and enlargement of existing ones, in 1917, is approximately 38,000,000 base boxes, it proved ample for all of the important requirements and there were a few months, notably May and July, when the output was close to that annual rate.

Failure to achieve a record in the matter of production was no fault of the manufacturers, for the causes were beyond their control; nor should there be any disappointment that a larger tonnage was not attained, for after all, the manufacturers were not so keen about setting production records as they were in meeting the demands that were placed upon them and in this latter respect, they succeeded admirably. The fact is that out of the long list of steel products, tin plate was one in which no real scarcity existed save for a short period at the start of the year when the railroads were so completely tied up.

A condition of chaos prevailed at the outset of the year, brought about largely by the transportation conditions. Although the food administration, because of the great demand for tin plate for preserving perishable foods and the importance of the canning industry to the food conservation movement, was induced to take action and secured assurances from the railroad administration of a better supply of cars, it was not until the middle of April that the car supply was sufficient and it was May before the tin plate industry got onto a full operating basis.

So crippled were the railroads that in January, the storage capacity of the mills was filled to the limit. There being no means of reducing these stocks, there was no other course open to the manufacturers but to curtail production. In the middle of January, the 30 tin plate mills of

Fixed Maximum Price

Tin plate, per 100 pounds, base Pitts... 7.75c

the Farrell, Pa., works of the American Sheet & Tin Plate Co. suspended operations and there were many other mills that had to take similar action. As there was danger that stocks stored in warehouses located along the rivers would be damaged in the spring floods, the railroad administration late in January was induced to provide relief in the shape of a larger number of cars. This helped, but the mills got out less than half of what they could had the railroad situation been normal.

February brought little increase in output, for while more cars were becoming available, they were not sufficiently numerous to make much of an inroad on the accumulated supplies. March was not greatly better as far as shipments were concerned, but mill operations increased as the amount of storage space increased. Thus production for the first quarter of the year was kept in check not through any fault of the manufacturers but because of transportation conditions. At least 40 per cent of the normal tonnages for the period was lost and left for the remainder of the year to make good.

Steel Allotment Curtailed

When transportation matters were corrected production came with a rush. May, with an output of 3,250,000 base boxes, made a record never before equalled for one month. Production in June also exceeded 3,000,000 boxes, while the July showing was 3,110,000 boxes, which was the greatest output for that month on record. Excessively humid weather, ordinarily experienced in July, came in August last year and caused a decrease in the working forces of the mills and a drop in production, but for the month, the output was only about 5 per cent less than that of the month before. The average for these four months was at an annual rate of more than 36,000,000 base boxes.

In looking round for means to increase the supply of steel in order to bring up the production of shells, plates and rails, the war industries board found that the requirements of tin plate for perishable food containers had been pretty well satisfied. Effective Oct. 1, therefore, it ordered that the steel allotment to the tin plate mills should be sufficient for only 70 per cent of capacity operations.

Some shortage of sheet bars existed early in the year but it was neither acute nor long lived. Ample supplies of bars were available thereafter until the cut in the allotment as of Oct. 1. Tin was scarce but not so scarce as to affect production and the price, while high during the first part of the year, dropped materially following a pooling of the allied supply and a distribution arranged at a conference in London, whereby the greater part of the world's supply was awarded this country. There has been enough sulphuric acid and ample supplies of palm oil.

Exports in the first nine months of 1918, which is as late as statistics are available, were 211,798 gross tons of tin and terne plate, as compared with 172,678 gross tons in the same period in 1917. An even greater tonnage might have gone out if it were not for the fact that Japan having obtained all the tonnage that was allotted in connection with the deal whereby this country provided steel in exchange for ships, several hundred thousand boxes that had been ordered were held up at Pacific ports. It is probable that these delayed shipments now will be allowed to leave the country.

The government maximum price for tin plate has been $7.75 per base box, Pittsburgh, throughout the entire year, but the average price received by makers, as disclosed in the bi-monthly wage settlements of workmen and manufacturers was above that figure, due to shipments against contracts made at a higher price. The average sales price for the September-October period as disclosed at the November meeting was $7.85 per base box, as compared with $8.10 in the same period in 1917 and with $8.60 reached in the last two months of 1917.

Every Ton of Steel Does Its Part

Requirements of War and Essential Industry Dominate Distribution of Semifinished Supplies—Operations of Sheet, Tin Plate and Wire Mills Are Limited—Demand for Shell Steel is Tremendous—Many Discards Sold

WHAT semblance of a commercial market in semifinished steel there remained at the end of 1917, vanished completely in 1918. When the nation got down to the real business of war, it brought to the foreground those requirements identified with war activities and shunted to the rear those needs, which eventually became classed as nonessential. The year had not become very far advanced before plans began to be shaped which eventually diverted every ton of steel the country could produce into one channel. This channel carried every pound to a government use; if not direct, then indirect.

If a monster pipe line connected with every oil producing field in the country and having only one outlet, can be imagined, a fairly complete picture of the steel industry in 1918 is provided. In the middle of the year, it was estimated that direct and indirect government requirements for the last half of the year would exceed 20,000,000 tons of rolled products. Calculations for the first half of the current year ran up to 25,000,000 tons. Thus for the 12 months from July 1, 1918, to June 30, 1919, it was figured that government needs alone would take every pound of steel that would be produced since, 43,000,000 tons was looked on as the maximum possible production.

In view of this statistical showing, it is not surprising that private requirements gave way to those of the government; and, that Washington took upon itself, with the earnest and wholehearted co-operation of the steel industry itself the distribution of all supplies of semifinished steel. Mills rolling shell rounds were allotted 100 per cent supplies of billets; mills taking billets for some other purpose were allowed a tonnage sufficient only for 50 per cent operations and the great bulk of the finished products went to some government use.

Shell requirements, of course, were the chief outlet for semifinished material in billets and some idea of the immensity of these needs may be gleaned from the fact that it was only through wholesale diversion of rail and wire mill capacity that a sufficient tonnage of rounds was rolled, while the forging capacity of the country became 100 per cent engaged about the middle of the year. Thereafter it became necessary to ship much steel for forging and finishing in England. Much of the rolling capacity of the Pittsburgh Steel Co. was used for rolling rounds for a considerable period of the year and late in the summer the Donora, Pa. works of the American Steel & Wire Co. was ordered changed over to 3-inch shell bars.

Fixed Maximum Prices

Pittsburgh and Youngstown	
Rerolling billets, 4 x 4 and larger	$47.50
Rerolling billets under 4 x 4	51.00
Slabs	50.00
Sheet bars	51.00
At Pittsburgh	
No. 5 common wire rods	$57.00
Forging billets	60.00
Forging ingots	73.00
Cold rolled strip steel	6.50c
Grooved skelp, per pound	2.90c
Universal skelp, per pound	3.15c
Sheared skelp, per pound	3.25c
Shell bars, 3 to 5 inches	3.25c
Over 8 to 10 inches	3.75c
Over 10 inches	4.00c

Practically all the material available in the form of billets during a greater part of the year was of discard steel. These were found quite useful by the steel casting producers in making shell ingots; also in the manufacture of light rails, which were in essential demand because of their use in coal mine operations. Lacking supplies of soft steel, wire makers experimented with these discards with some degree of success and they also were rolled into sheets of heavy gage, into small shapes, reinforcing bars, etc. The government kept pretty close control of supplies and until near the end of the war, only small tonnages of semifinished material reached the ordinary trade channels, as billets, sheet bars, slabs, etc.

Shell Tonnage is Huge

Early in January, it was announced that 1,500,000 tons of shell steel had been placed, the last shipment to be made by June. In March, new shell requirements aggregating 183,000 tons were placed with Pittsburgh and valley makers. About a month later, the requirements of this country and the allies in shell billets and rounds for the remainder of 1918 were announced and involved a total of more than 4,000,000 tons. Late in the summer, came another big demand for shells and shell steel, which was estimated in excess of 4,000,000 tons; it was a hurried call that was rendered necessary by the fact that in their spring drive, the Germans had captured immense allied munition supplies.

Demand for billets continued active even in the face of these immense requirements, but was obliged to go unsatisfied. There was some easing in the supply following the signing of the armistice in November, which in turn was followed by the cancellation or adjustment of most of the unfilled foreign orders for shell steel. The price of billets both bessemer and open-hearth fixed at $47.50, Pittsburgh and Youngstown, O., for standard rerolling 4 x 4 billets on Oct. 24, 1917, ruled throughout 1918.

Discard billets were held early in the year at the government rerolling billet level of $47.50, but this price was not obtained, except in a few cases. No sizable transactions took place much above $45. Heavy accumulations of discards developed late in the year, when the production of shell rounds was greatest and when the war industries board ordered that all business in semifinished steel should be directly between producers and consumers.

With the signing of the armistice, there were few producers of shell rounds who did not have heavy supplies of discards and in their efforts to move these supplies, prices were sliding off quite rapidly at the end of the year. Makers of hard bars, who had been fairly heavy users of this kind of steel, found themselves pretty heavily stocked, not only with discards, but also with finished bars, demand for which had fallen to slim proportions, because of the cancellations of so much of the government's construction program and the fact that while peace brought a release of private undertaking, there was no immediate increase in the amount of such work. Discards could be bought at $40 at the close of the year and it was even stated that liberal tonnages had been offered for scrap as low as $34.

Demands upon the supply of slabs also were tremendous, for 100 per

cent government purposes, with no tonnages available for finishing mills engaged on non-government work until after the conclusion of hostilities.

It was easier for finishing mills to secure slabs in December than it had been during the year but not below the government price.

Marked scarcity of sheet bars ruled throughout the year, for while tin plate was rated as an essential product, because of importance in the preserving of foods, no such view was entertained with regard to the uses of the products of the sheet mills. Sheet makers took bessemer bars, where they had used open-hearth steel. From May on, there were no sheet bars for nonessential consumers. Tin plate mills secured a full allotment until Oct. 1, as requirements for food containers got a high priority rating, but the sheet mills rarely were able to exceed 50 per cent operations because of the lack of steel.

The year ended with sheet bars more plentiful than they had been for some time previously, but with prices firm at the government base of $51, Pittsburgh or Youngstown, for either open-hearth or bessemer bars. Demand was good, as the sheet mills had heavy back orders, on which delivery was being pressed, while much new business was developing.

Production of wire rods tapered off steadily during the year until after the signing of the armistice, for outside of barbed wire, most products of rods were rated as nonessential to the war program. At times the rod mills ran at less than 50 per cent capacity. The release of soft steel through the ending of the war was followed by a rise in rod production, but open market supplies still were rather scant, for accumulated orders for finished products were absorbing most of the augmented tonnage. Considerable export demand also appeared. The government price of $57 per gross ton, Pittsburgh, for No. 5 common rods, established on Oct. 11, 1917, was maintained without change throughout the year.

Warehouses Fill Essential War Duty

STEEL warehouses in 1918 passed through an unusual and difficult experience. War requirements made the position of the jobber of great value to the manufacturer early in the year and rewarded him in the latter part by making it almost impossible for him to obtain stock for his depleted assortments.

As requirements for the government's war program developed through the year and priorities were established in ever-tightening control, mills were able to ship only where directed and in accordance with the strict letter of the new regulations. These did not provide for warehouses being given much share in the mills' output.

Warehousemen bestirred themselves and made a strong case before the war industries board. They pointed out that they had been the only source of steel supplies needed with promptness early in the year, furnishing needed steel to manufacturers engaged on most essential government work.

Mills could not meet the demand and the warehouse had saved the day in many cases.

When the priority plan had been worked out fully, jobbers were given a rating of B-4 and provision was made that for delivery in August each warehouse could enter contracts for a tonnage equal to the average purchased for the first six months of the year. But mills had so many orders ahead for steel on A priorities that only B-1 and B-2 stood any chance of receiving material.

In the price announcement of Sept. 24, differentials to be added to mill prices were announced and this was amplified by a table applying the differentials and freight charges on a large number of products at important warehouses in large business centers.

In late October warehouses were given a priority of A-5 for steel furnished to manufacturers engaged on work carrying an A priority and this relieved the situation to a considerable degree. To protect their replacements it was required that all buyers execute an affidavit of the essential use to which the material was to be put, to assure the warehouse of its being replaced by the mill on the next month's order. When the tenseness of priority was relaxed, large orders to fill out depleted stocks were placed with mills, particularly for sheets, which had become almost exhausted in the hands of jobbers.

November 19, about a week after the signing of the armistice, the director of steel supply made formal announcement of the removal of all restrictions on warehouse trade except as to prices.

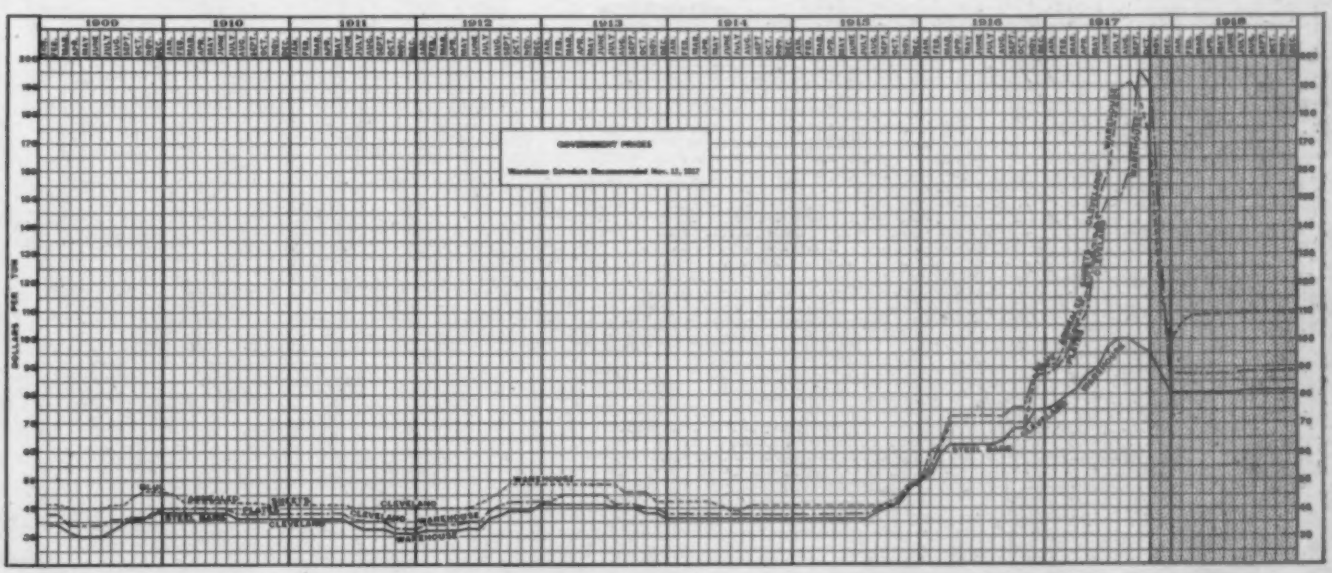


CHART OF AVERAGE MONTHLY PRICES OF LEADING WAREHOUSE PRODUCTS, CLEVELAND 1909-1918

Plate Mills Under Great Pressure

Overwhelmed With Demand for Shipbuilding, Railroad Equipment and Other Requirements of Essential Character, Producers Are Forced to Combat Worst Operating Conditions in Their History—Many Cars Ordered

PLATES during 1918, from the standpoint of tonnage production, assumed rank as the most important of all the finished iron and steel products. The huge plate requirements of the shipbuilding program and the needs for car and locomotive building, for boilers, tanks and a host of other war essentials, as well as the great war demands of the allies, reached such proportions in the opening months of the year that it speedily became apparent, despite contrary opinions previously held in the industry, that there would not be enough plates to go around. During the entire year, therefore, there was a never-ending cry for increased capacity and increased production of plates, and it was in this product that priorities in shipments were applied with greatest discrimination and rigor. At no time was it possible to obtain plates in the market with any ease, and during the greater part of the year it was possible to get them only through allocations by the war industries board and then only in accordance with priorities ratings determined by the purposes for which they were to be used.

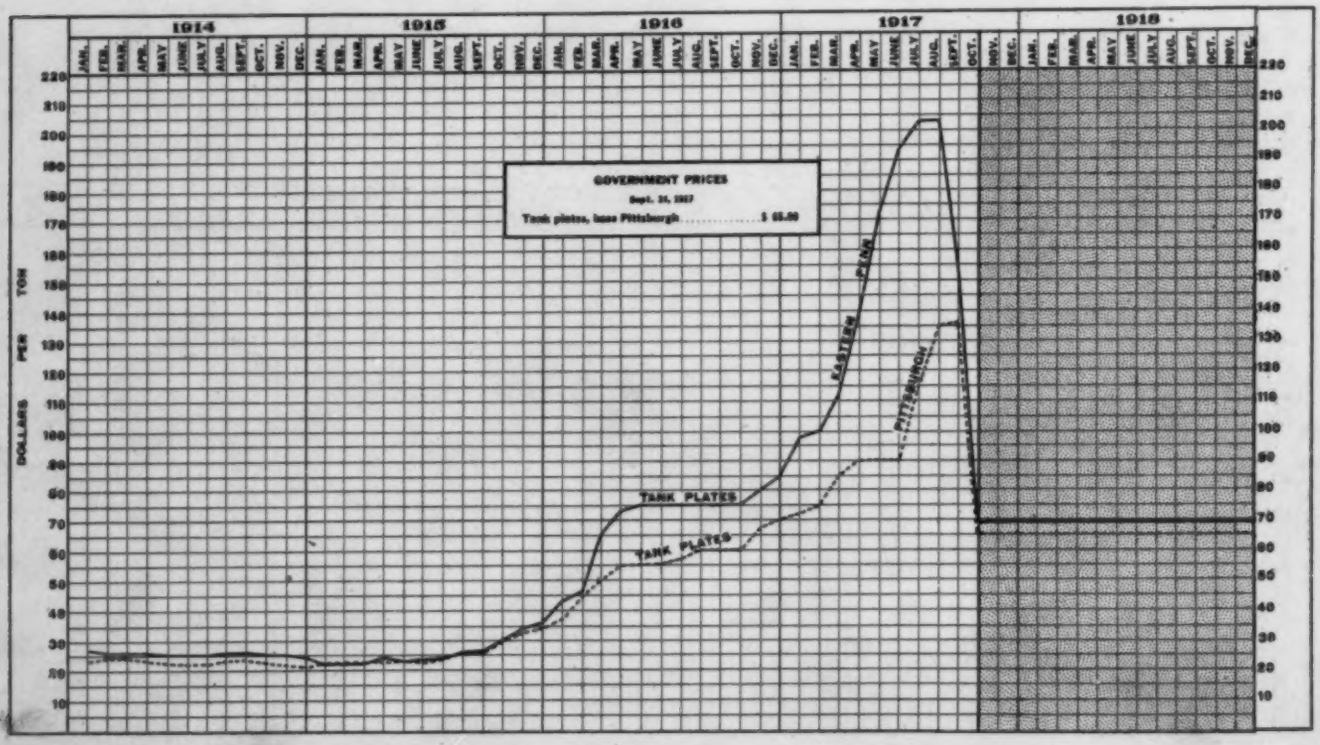
Mills began the year by turning away inquiries which reached staggering proportions. At that time they had sufficient business on their books to take their output over the greater portion of the year. Practically their entire output of sheared plates, and most of the universal plates were going to the government, so that all the mills had to offer at that time were limited tonnages of universal and some bessemer steel plates. By February, however, sales of the latter had come to an end, and the mills realized that the government would be practically their only customer. Government tonnage piled up so rapidly on the mill books that by March it became very difficult for the government to place even the most urgent tonnages. In fact, it became necessary in all cases where a new tonnage urgently was required, to make room for it by displacing other urgent tonnages previously placed. It was this situation that caused the war industries board ultimately to place all the plate mills under a pledge by which they agreed to furnish 100 per cent of their output to the government or on government allocations. Many users of plates were unable to secure priority ratings. One of these for instance, was the oil industry, which desired plates for conversion into tanks for the storage of oil.

Fixed Maximum Price

Steel plates, base Pittsburgh..... 3.25c

Most important of the uses to which plates were put during the year, of course, was shipbuilding, and shipbuilding requirements at all times had the right of way. Considerable difficulty was encountered early in the year due to the imperfect methods by which orders for ship steel had been allocated. Prior to May, orders had been placed without much reference to the transportation possibilities involved in shipping plates from the mills to the fabricating shops and in turn to the shipyards.

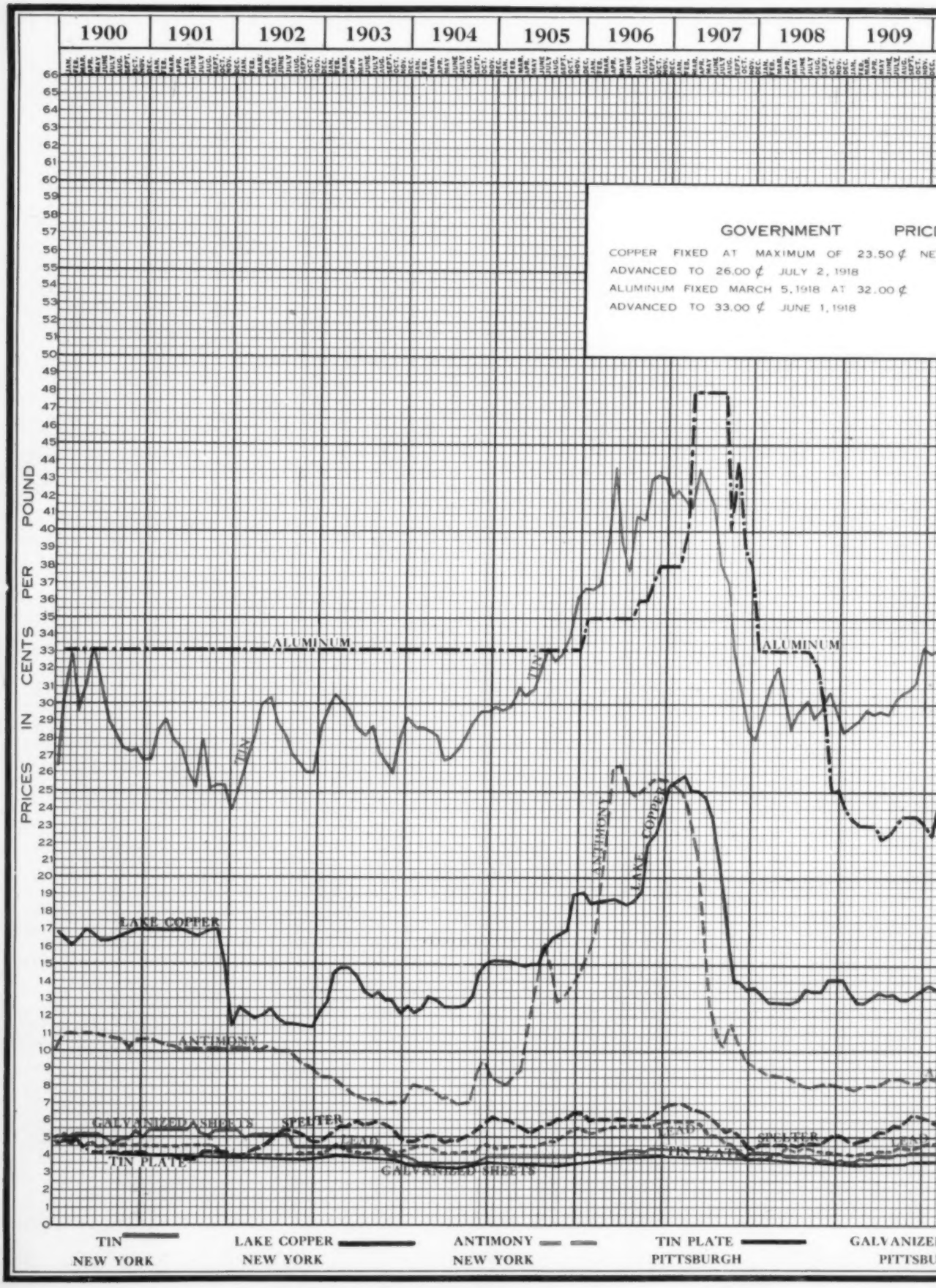
Under the new system which was inaugurated in the month of May orders were reallocated to mills and fabricating plants in such a way that the steel would have the shortest possible hauls. By the new system the Emergency Fleet corporation greatly increased their demands upon



TANK PLATE PRICES, PITTSBURGH AND EASTERN PENNSYLVANIA, 1914-1918

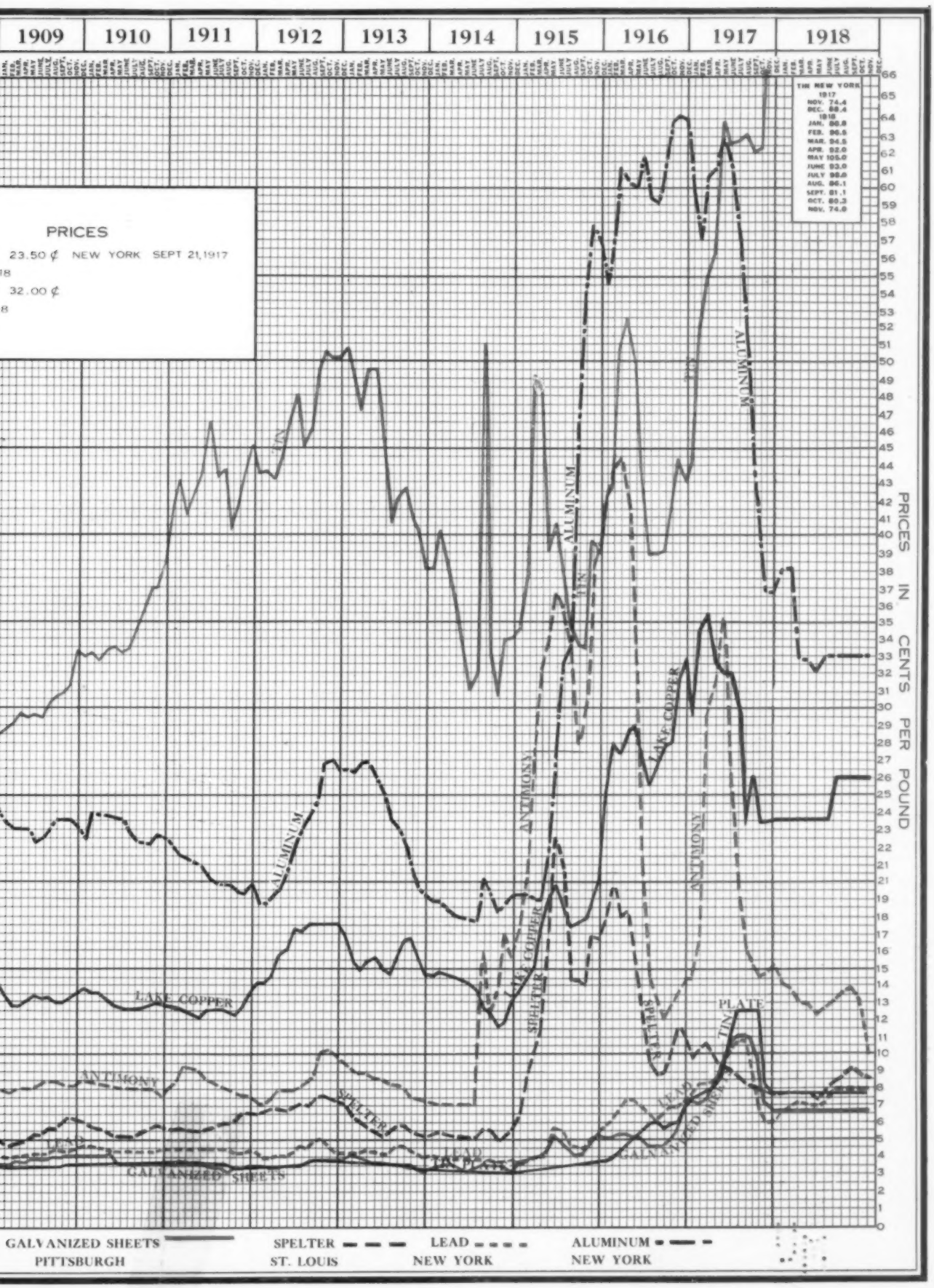
THE IRON TRA

Fluctuations in prices of pig tin, aluminum, antimony, lake copper,



TRADE REVIEW

copper, spelter, lead, tin plate and galvanized sheets, 1900-1918



the plate mills, and called for an additional 50,000 tons per week in order to pile up a reserve, or "cushion", of 250,000 tons at shipyards in order to maintain shipbuilding operations during the winter.

All makers adhered to the agreed maximum base price of 3.25c, Pittsburgh, throughout the year. Few complaints as to this price were heard from the mills owning their raw materials. Some of the mills in class 3, however, which included those who bought their pig iron in the market, were unable to produce tank plates at a cost which would have allowed them to come out whole at the agreed selling price. When these mills asked for relief before the price-fixing committee of the war industries board, it developed that the differentials which they were able to obtain for specialties which they produced, enabled them to show profits on the entire bulk of their business, so that their request for a higher base price on plates was denied.

Some Attempts at Repudiation

One of the difficulties which mills encountered early in the year was a tendency on the part of some customers to refuse to take plates on contracts which had been placed at the high prices ruling prior to Sept. 24 and Sept. 17. Many attempts at such repudiation were dropped and the contracts which were cancelled involved very little tonnage in the aggregate. In many cases, however, the mills showed a disposition to compromise on these old high priced contracts.

A development which caused considerable satisfaction was the withdrawal, by the war industries board, in June, 1918, of Chicago as a basing point. The use of Chicago, like Pittsburgh, as a basing point, originated Sept. 24, 1917, when the agreed price schedule first was adopted. Under this dual basing system the war industries board had ruled that eastern mills would have to sacrifice the freight when shipping to Chicago while western mills would have to sacrifice the freight differential when shipping east.

Licenses for exporting plates were granted with extreme care by the war trade board all through the year. France, Italy and Japan all obtained huge tonnages of plates from the United States during the year. Japan in May succeeded in obtaining licenses for some 200,000 tons or about 50 per cent of the Japanese plate orders then on the books of the mills.

From a production standpoint 1918 was one of the most difficult years in the history of the industry. During the first three months, production hovered around 30 to 75 per cent of capacity due to the congestion of the railroads and consequent inability of the mills to obtain sufficient coal, pig iron and other materials to maintain output. For a month or two in the fall, output was cut nearly in half for several weeks by the influenza epidemic. Labor shortage and attendant dilution at all times were handicaps. Operations reached their maximum during the summer, and during the third week in August, plate mills shipped 117,000 tons, equivalent to more than 6,000,000 tons per year.

Under impetus of the heavy requirements of war however, and despite the shortage of steel, the building of cars in 1918 was carried out on a larger scale than for several years past. In fact, the volume of cars placed in 1918 was almost twice again as large as in 1914, the year hostilities broke out in Europe. With the federal authorities in control of the domestic railroads and a heavy volume of equipment needed for the American expeditionary forces, the government was by far the larger buyer, taking in all more than 179,000 cars, although cancellations on the cessation of hostilities approximated 40,000.

Total car orders placed with American car builders by months as compiled by THE IRON TRADE REVIEW for the past several years are as follows:

	1918	1917	1916	1915
Jan.	200	15,000	21,700	2,500
Feb.	4,575	7,750	12,900	4,000
Mar.	2,190	21,500	8,750	1,100
Apr.	31,150	4,250	7,000	1,500
May	70,165	15,000	4,225	18,000
June	400	8,200	1,300	17,000
July	30,000	8,650	2,600	9,500
Aug.	10,000	13,000	15,025	3,000
Sep.	4,000	1,100	15,500	9,000
Oct.	40,900	42,800	26,000	22,500
Nov.	200	10,000	37,000	11,500
Dec.	8,000*	1,000	19,600	10,400
Total	201,780	148,250	171,600	110,000

*Estimated.

Much Steel is Diverted from Wire Mills

HIGHLY essential for war purposes and much less essential in nonwar uses wire and wire products have passed quite an eventful period in the year just closed. Modern warfare has made great use of wire at the front, for entanglements and for communication lines, and in the military preparations in this country as well as in building of immense proportions in France in connection with the military plants of the United States nails have been consumed in tremendous quantity.

So great have been the demands for wire by the allied governments that large tonnages of wire rods were shipped abroad to be drawn there instead of in this country. Through the year the United States and its allies have been the preponderant purchasers of wire and its products. The barbed wire tonnage easily led and ran to enormous proportions due to the fact that this material largely is destroyed as the armies advance or are pushed back and as barrages cut down the defenses at the front.

Fixed Maximum Prices

Plain wire, base Pittsburgh	3.25c
Wire nails, base Pittsburgh	3.50c
Barbed wire, base Pittsburgh	3.65c

Tonnages of 50,000 tons for England and for France were common and even larger orders were placed in this country. In October an order for 150,000 tons was about to be distributed when the signing of the armistice caused its withdrawal.

Early in the year the war department asked competitive bids on nails, asserting that the fixed price of $3.50 per keg was only a recommendation and was not official. Inquiries for nails up to 500,000 kegs were received as cantonment construction in this country and military building in France came to its highest activity.

Outside its strictly war use wire was regarded as less essential than other forms of steel and restrictions were placed on the tonnage of ingots available for wire mills. At times production ran as low as 45 per cent of capacity. In some instances wire mills which produce their own steel were required to ship billets and slabs to bar and plate mills for the production of shell bars and ship plates, thus restricting the output of wire for lack of steel.

Wire fence was recognized as essential to food production late in the year and restrictions as to its production were removed. However, self-contained wire manufacturers were not allowed to weave fence, though they were allowed to sell plain wire to smaller concerns turning out that product. The price of plain wire fixed Nov. 5, 1917, at $3.25 per 100 pounds, Pittsburgh, remained in force through the year. Wire nails were held at $3.50 per 100 pounds, Pittsburgh, as fixed Nov. 13, 1917.

the plate mills, and called for an additional 50,000 tons per week in order to pile up a reserve, or "cushion", of 250,000 tons at shipyards in order to maintain shipbuilding operations during the winter.

All makers adhered to the agreed maximum base price of 3.25c, Pittsburgh, throughout the year. Few complaints as to this price were heard from the mills owning their raw materials. Some of the mills in class 3, however, which included those who bought their pig iron in the market, were unable to produce tank plates at a cost which would have allowed them to come out whole at the agreed selling price. When these mills asked for relief before the price-fixing committee of the war industries board, it developed that the differentials which they were able to obtain for specialties which they produced, enabled them to show profits on the entire bulk of their business, so that their request for a higher base price on plates was denied.

Some Attempts at Repudiation

One of the difficulties which mills encountered early in the year was a tendency on the part of some customers to refuse to take plates on contracts which had been placed at the high prices ruling prior to Sept. 24 and Sept. 17. Many attempts at such repudiation were dropped and the contracts which were cancelled involved very little tonnage in the aggregate. In many cases, however, the mills showed a disposition to compromise on these old high priced contracts.

A development which caused considerable satisfaction was the withdrawal, by the war industries board, in June, 1918, of Chicago as a basing point. The use of Chicago, like Pittsburgh, as a basing point, originated Sept. 24, 1917, when the agreed price schedule first was adopted. Under this dual basing system the war industries board had ruled that eastern mills would have to sacrifice the freight when shipping to Chicago while western mills would have to sacrifice the freight differential when shipping east.

Licenses for exporting plates were granted with extreme care by the war trade board all through the year. France, Italy and Japan all obtained huge tonnages of plates from the United States during the year. Japan in May succeeded in obtaining licenses for some 200,000 tons or about 50 per cent of the Japanese plate orders then on the books of the mills.

From a production standpoint 1918 was one of the most difficult years in the history of the industry. During the first three months, production hovered around 30 to 75 per cent of capacity due to the congestion of the railroads and consequent inability of the mills to obtain sufficient coal, pig iron and other materials to maintain output. For a month or two in the fall, output was cut nearly in half for several weeks by the influenza epidemic. Labor shortage and attendant dilution at all times were handicaps. Operations reached their maximum during the summer, and during the third week in August, plate mills shipped 117,000 tons, equivalent to more than 6,000,000 tons per year.

Under impetus of the heavy requirements of war however, and despite the shortage of steel, the building of cars in 1918 was carried out on a larger scale than for several years past. In fact, the volume of cars placed in 1918 was almost twice again as large as in 1914, the year hostilities broke out in Europe. With the federal authorities in control of the domestic railroads and a heavy volume of equipment needed for the American expeditionary forces, the government was by far the larger buyer, taking in all more than 179,000 cars, although cancellations on the cessation of hostilities approximated 40,000.

Total car orders placed with American car builders by months as compiled by THE IRON TRADE REVIEW for the past several years are as follows:

	1918	1917	1916	1915
Jan.	200	15,000	21,700	2,500
Feb.	4,575	7,750	12,900	4,000
Mar.	2,190	21,500	8,750	1,100
Apr.	31,150	4,250	7,000	1,500
May	70,165	15,000	4,225	18,000
June	400	8,200	1,300	17,000
July	30,000	8,650	2,600	9,500
Aug.	10,000	13,000	15,025	3,000
Sep.	4,000	1,100	15,500	9,000
Oct.	40,900	42,800	26,000	22,500
Nov.	200	10,000	37,000	11,500
Dec.	8,000*	1,000	19,600	10,400
Total	201,780	148,250	171,600	110,000

*Estimated.

Much Steel is Diverted from Wire Mills

HIGHLY essential for war purposes and much less essential in nonwar uses wire and wire products have passed quite an eventful period in the year just closed. Modern warfare has made great use of wire at the front, for entanglements and for communication lines, and in the military preparations in this country as well as in building of immense proportions in France in connection with the military plants of the United States nails have been consumed in tremendous quantity.

So great have been the demands for wire by the allied governments that large tonnages of wire rods were shipped abroad to be drawn there instead of in this country. Through the year the United States and its allies have been the preponderant purchasers of wire and its products. The barbed wire tonnage easily led and ran to enormous proportions due to the fact that this material largely is destroyed as the armies advance or are pushed back and as barrages cut down the defenses at the front.

Fixed Maximum Prices

Plain wire, base Pittsburgh	3.25c
Wire nails, base Pittsburgh	3.50c
Barbed wire, base Pittsburgh	3.65c

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Sheet Mills Struggle to Fill Needs

Restricted in Supply of Sheet Bars, Makers Are Obliged to Limit Deliveries to Only Essential Wants—Shipping Price Closely Approximates Fixed Figure—Market Quickly Broadens With Coming of Peace

BI-MONTHLY wage agreements based on average sales prices clearly portray the character of the activities of the sheet mills in 1918. Steady approach to the fixed government base, as disclosed at these wage fixing conferences, indicates that an increasing amount of the business was at the government price; in other words, the higher-priced contracts were set aside that the direct and indirect government requirements might be met.

The January conference between the representatives of the National Association of Sheet & Tin Plate Manufacturers and the Amalgamated Association of Iron, Steel & Tin Workers disclosed an average realized price for 26, 27 and 28 gage black sheets for the last two months of 1917 of $5.50 per 100 pounds. At the November, 1918, meeting the average price for the preceding two months was $5 even. The government base was $5 for No. 28 gage black sheets, with 5 cents off for No. 27 gage and 10 cents off for No. 26 gage. The government average for these three gages, therefore, would be $4.95. It is evident from the September-October average therefore, that little was done by the mills save to fill allocated government business which took the fixed price. All other orders remained unfilled.

Fixed Maximum Prices

No. 28 gage black sheets, base Pittsburgh 5.00c
No. 28 gage galvanized, base Pittsburgh.. 6.25c
No. 10 blue annealed, base Pittsburgh... 4.25c

The year of 1917 has been described as a trying one for the sheet manufacturers, because they not only were called on to supply huge government needs, but also big demands from commercial consumers. But last year's problem was a far more difficult one than that of 1917, for in the latter year there was a fairly good supply of labor and of steel, while in the period just ended, steel supplies tapered steadily until it became apparent that Germany had shot her bolt, while the labor supply suffered serious depletion. The steel supply got so low that for a long period mill operations did not average better than 50 per cent.

Workmen Follow Wages

Other lines of work offered more opportunities for big wages than did the sheet mills on this scale of operations and the workmen in large numbers went over to plants where they could get the most for their labor. In addition, a good many men were drafted for military service and in the fall came the influenza epidemic, which over a period of more than a month seriously reduced working forces, especially in the galvanizing departments. Sheet bars were scarce throughout the year until the signing of the armistice and markedly so only a few weeks before Germany showed unmistakable signs of collapse. Open hearth bars were almost unobtainable during the greater part of the year, for all the open hearth steel produced was reserved for the government for other uses. The end of the war was followed almost immediately by the lifting of restrictions on private use of steel and it is worthy of note that in no division of the steel industry was the lifting of the consumptive regulations followed by so much activity as in sheets.

Automobile manufacturers, about the heaviest individual consumers of sheets, instantly set about to bring pleasure car production back to where it was before the war industries board had ordered a sharp cut in output. The automobile industry was down to a basis of 25 per cent of 1917 production when the announcement came that it might increase output by 50 per cent of the ordered curtailment. The curtailment being 75 per cent, this permitted a production of 62½ per cent. Heavy demands instantly

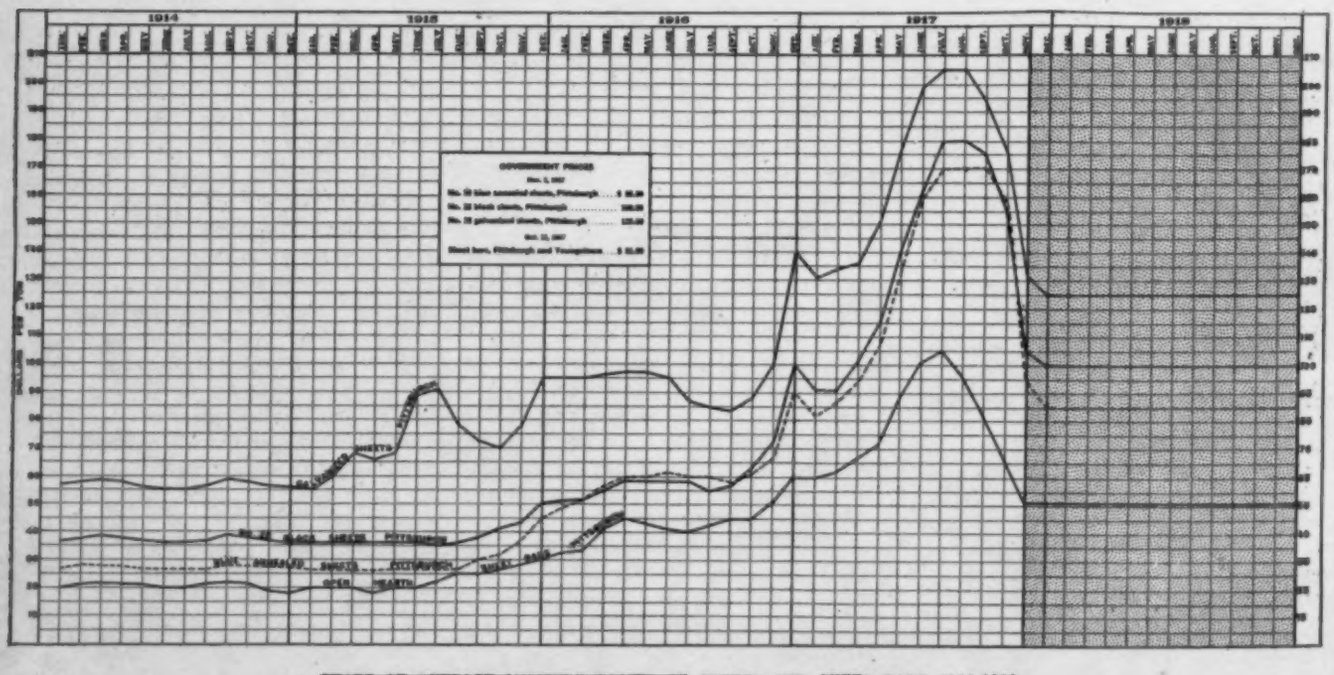


CHART OF AVERAGE MONTHLY PRICES OF SHEETS AND SHEET BARS 1914-1918

began to come to producers for the delivery of sheets on old orders placed by the automobile builders. Some difficulty was experienced in meeting these demands because the ending of the war was not followed immediately by much increase in the supply of open hearth sheet bars and outside of the very cheap cars, nothing but open hearth steel sheets are used.

The subcommittee of the American Iron and Steel institute allocated approximately 445,000 tons of sheets. This amount, of course, does not include all of the war business in sheets, for a considerable tonnage was placed by consumers direct with manufacturers. The total rather represents the demands of those contractors who were unable to secure supplies at their regular sources and therefore appealed to the committee on sheet steel for relief.

Other business of long standing also pressed for delivery and a number of new demands came out as the year drew to a close. Building trades were looking for roofing material and for metal lath, while in spite of the fact that the stove and range manufacturers were supposed to have had generous stocks when ordered to curtail production, there was a strong demand for supplies from that source. Altogether the arrival of peace put new life into the sheet industry and mill operations, which frequently averaged only 50 per cent of capacity and at the plants of the leading interest at one time were as low as 30 per cent, instantly began to expand. December found some plants running as high as 85 per cent.

Sale and Fixed Prices

AVERAGE SALES PRICE NOS. 26, 27 AND 28 BLACK SHEETS

November-December, 1917	$5.50
January-February, 1918	5.35
March-April, 1918	5.10
May-June, 1918	5.15
July-August, 1918	5.15
September-October, 1918	5.00

The American Sheet & Tin Plate Co. reported last month that it had sufficient business in sight to keep its plants going 85 per cent full for four months. The Farrell, Pa., plant, which ran only part time during the summer, was brought up to 100 per cent on Dec. 9, and the Scottdale, Pa., works, which were idle much of the summer were started again full time early in December.

Actual cancellations at the ending of the war were nil, although suspension of a fairly large tonnage was ordered. One good sized direct government order was cancelled and this was for helmets. This contract was made only about a week or 10 days before the armistice was signed and no work had been done on it. In all other instances, manufacturers refused to cancel.

It long has been the contention of the sheet industry that a contract should be a contract and having worked long and hard to make its contracts binding, there has been no inclination on the part of manufactures to yield on these government orders. No disposition to hold the government to the fulfillment of its obligations was shown but producers believed they should be remunerated against loss. Government contractors have been refused cancellations, but they have been granted deferred shipments and the right to file full data in individual cases for presentation to the government.

Some consumers sought to be relieved of old orders placed at high prices but without success. Such cases, however, have not been numerous, nor has a large tonnage been involved. In a number of cases where users engaged on government work have obtained suspensions they have respecified this tonnage and have substituted peace for war material.

Government or allied wants kept flowing in on makers so persistently and without any increase in the supply of sheet bars, that the American Sheet & Tin Plate Co. early in May decdied not to open its books for last half orders, since it could not guarantee either size or delivery. Placing by the railroad administration of 45,000 box cars, involved another large essential demand for sheets about the middle of May. Heavy government requirements appeared steadily and did not cease when peace talk became strong in the early fall. Right in the midst of the reports of an early peace, an order for about 50,000 tons for export to France was placed.

Cast Iron Pipe Prices Rise During Year

UNLIKE many iron and steel products cast iron pipe during the year 1918 advanced materially in price under government control and closed the year 20 per cent higher in its base price at Birmingham, with heavier increase at other basing points, due to a sharp advance in railroad rates at the middle of the year. Class B pipe, 6 inches and larger, opened the year at $49, Birmingham. May 21 an advance of $6 was allowed and Sept. 24 another increase of $5 was given, a total of $11. The freight rate to New York at that time was $6.35 and to Chicago, $5.35. On June 25 these rates were advanced to $7.75 to New York and to $6.80 to Chicago, increasing the base price at these two cities in equal degree, in addition to the advance in the cost of the pipe at the point of production.

Demand for pipe from usual sources was unusually slack throughout the year. This was due in the early months to the high cost compared with previous years, most municipalities being staggered by the figures presented when waterworks extensions were considered. Later in the year when the essential nature of such work was under close scrutiny before purchase was allowed this demand was restricted further. On the whole, buying for ordinary use by cities was much less than normal. Extensions to meet new conditions of industry and housing problems where labor was concentrated for war work were undertaken, cost not being factor and the essential nature of the improvement being plain. The government was the largest buyer, taking large tonnags for camps, cantonments and naval stations.

Fixed Maximum Prices

Per Ton

Standard pipe, 6 inches and larger, Class B or heavier.

Jan. 1 to May 21	
Birmingham	$49.00
New York	55.35
Chicago	54.35
May 21 to Oct. 1	
Birmingham	$55.00
New York	61.35
Chicago	60.35
Oct. 1 to Jan. 1	
Birmingham	$60.00
New York	67.70
Chicago	66.80

Expansion of industry caused a heavy call for pipe and even heavier for special castings, the production of which was suited to pipe shops more than to the ordinary foundry. In seeking a source for such large work the government foundry ready service in pipe foundries.

When the war ended buyers who had contracts pending at prevaling high prices held off from closing, hoping a lower level would be reached soon. Cities delayed outlining their requirements for 1919 and remained out of the market.

Bar Market Has Many New Features

Demands Could Not Be Met Fully Because of Heavy Needs of Steel for More Essential Uses—Shell Discards Are Utilized—Implement Manufacturers Get Concession—Bar Iron Market Disappoints

HISTORY was made rapidly in the steel and iron bar market in 1918 and new features developed constantly as urgent war measures were taken to meet the needs of the government. More bars were required than could be produced without taking steel from other finished products needed as keenly as bars, or perhaps of greater importance in the country's war program. To hold the scales even and direct production in a way to serve best the general aim was a task requiring complete knowledge of the situation on the part of those in authority and close, sympathetic co-operation on the part of steel producers. Both those directing production and the producer proved equal to the task imposed upon them.

The first quarter was a disappointment from a tonnage point of view. Just when largest output was needed, unusual storms and cold weather paralyzed the transportation system of the north, delayed fuel and raw materials and caused great curtailment in production of blast furnaces and mills. Operating conditions which could be called normal were not attained until the end of March and for weeks thereafter, there was some delay because of small car supply that delayed fuel and prevented maximum shipments, which in turn slowed up production.

Later in the year things were better and some high records of production were made. At times mills were directed to divert ingots from bar mills to plate mills when plates were most in need and this condition was in evidence much of the time. To make up for this lack of rolling material bar mills were given steel that ordinarily would have gone to rail mills. So great was the demand for rounds for shellmaking that they were produced at times on structural, rail and axle mills.

Government Takes Control

In April the agencies of the government had been organized sufficiently to exercise wide control and heavy allocations of steel bars were made, as well as of other finished steel. This condition continued to the end of the year, or rather until the armistice was signed. The plan of limiting shipments to essential war uses was developed to a high point in the second quarter and by June the government announced it had taken complete control of the steel production of the country. Practically all orders accepted were from the government, though some bessemer steel was available for nonwar use.

Fixed Maximum Prices

Steel bars, base Pittsburgh	2.90c
Common iron bars	3.50c
Refined bars all scrap	4.25c
Refined bars, pig iron and scrap	5.00c
Rail steel bars, base mill	3.00c
Steel bands, base Pittsburgh	3.50c
Steel hoops, base Pittsburgh	3.50c
Hot rolled strip steel, base Pittsburgh	3.50c

Bar Iron Prices

BI-MONTHLY WAGE SETTLEMENTS SHOWING AVERAGE PRICES

	1914	1915	1916	1917	1918
Jan.-Feb.	1.1590c	1.024c	1.40c	2.35c	3.10c
Mch.-Apr.	1.1760c	1.05c	1.60c	2.45c	3.30c
May-June	1.1257c	1.10c	1.85c	2.65c	3.35c
July-Aug.	1.0928c	1.15c	1.95c	2.75c	3.40c
Sep.-Oct.	1.0847c	1.20c	2.00c	2.85c	3.45c
Nov.-Dec.	1.037c	1.30c	2.15c	2.95c	.....

ANNUAL AVERAGE OF SETTLEMENT

1918 (10 months)	3.32c
1917	2.67c
1916	1.825c
1915	1.137c
1914	1.1843c
1913	1.4421c
1912	1.2645c
1911	1.2598c
1910	1.4423c
1909	1.360c
1908	1.386c
1907	1.627c
1906	1.587c

Governmental allocations most of the year were greatly in excess of producing capacity and every effort was made at all times to produce at the highest speed, the supply of ingots being the neck of the bottle which controlled tonnage. Some steel users about the middle of the year took bars rolled from shell crops and other discard steel, which served their purpose. In this way they tapped a source of supply without which their needs would have gone unsatisfied. With finishing capacity in excess of ingot supply, there was no objection to this selling, even though it might have been for uses other than war production. Demand for this class of steel became insistent in the fear that the government might take over even the discards.

Agricultural implement makers bought bars in January for first half requirements and in June covered for last half. Some priority was given to this line of manufacture in February and later the implement industry received added preference. Bessemer bars were substituted for basic in much of the steel bought by the implement manufacturers.

Heavy Export Demand

In January, an effort was made to repudiate bar contracts made in 1917 at prices much above those fixed by the government but after considerable negotiation buyers were persuaded to take out their tonnages at the contract figures. This effort was made principally by fabricators and nut and bolt makers who averred they could not raise the prices of their products sufficiently to meet the high cost of their raw material. Export demand through the year was strong and at times as high as 3.60 cents was offered for material to go abroad. Under pressure for bars for war use the only important tonnages exported were shell bars for the allies.

Various features of interest came up during the year in the matter of prices fixed on steel and iron bars. The figure named in 1917 as the maximum on steel bars, 2.90 cents, remained in force through the year, except that the double basing points, Pittsburgh and Chicago, which prevailed through the first six months, were dropped in the price schedule announced by the President, effective July. 1. Pittsburgh then became the sole basing point. This change had the effect of increasing the price 27 cents per 100 pounds at New York and Chicago.

The change in basing point was made after agricultural implement makers had covered their requirements and the added freight made a difference of about $5 per ton on their raw material. Inasmuch as increased prices on their implements were said to be out of the question, this industry asked a special concession of $5 per ton on steel, which was granted after several weeks of delay. The reduction was restricted to material going into agricultural implements only, the test being that the latter were to be used in the production of food. As an example of the exceptions made the concession could not apply on steel for lawnmowers,

though built by manufacturers of farm implements. This is the only instance of a special concession made to a particular industry under the price fixing program.

Three Classes of Quotations

The only other change in prices was a division of quotations on bar iron, three classes being provided instead of one as formerly. In the fixing of a maximum in 1917, 3.50 cents mill, was set for bar iron and this continued until Oct. 17, 1918, when announcement was made that this figure should apply only on common bar iron made from scrap, and that for refined iron made from puddle bar the maximum should be 5.00 cents mill. Coupled with this announcement was the provision that certain small and certain large sections must be graded as refined iron at the new price. Believing that the decision had been made without sufficient investigation of conditions, western bar makers at once took up the matter with the proper institute committee and obtained a radical change in the announcement. Instead of it being mandatory that the large and small sections be graded as refined iron, this was made optional and an intermediate grade was substituted, called refined iron, but made from selected scrap. On this grade an extra of 0.75 cents per pound is allowed while on refined iron from puddle bar and selected scrap an extra of 1.50 cents per pound is allowed. At the same time the card of extras for size was rewritten. Previously it had been the custom to use "half extras", that is, half the extras provided on the card. To simplify matters a new card was put in force carrying half the former extras.

Bar iron demand through the year was below normal and at no time did mills have sufficient orders on books to assure them a comfortable position. Yet not much time was lost and the year has been fairly profitable.

When the federal railroad administration's order for 100,000 freight cars was placed, steel mills were loaded with other work and it was believed much iron would be used but this did not work out. The railroad administration found that the Santa Fe and the Great Northern railroads had bar iron capacity at their rolling mills for more than they use in their own work and this was offered on the market at 3.00 cents, while the maximum price was 3.50 cents. Later railroads were ordered to place their orders with these mills as far as the supply would go. This caused the railroads to use up more of their wrought scrap than usual and reduced offerings on the scrap market to a considerable extent.

Make Chain Iron in West

Eastern manufacturers of chain iron found demand for this material to meet the great shipbuilding program greater than they could handle and considerable tonnages of chain iron were produced in the west, both for Atlantic and Pacific chain makers. This grade of iron had not been made heretofore in the west. Chainmakers had capacity business through the year, being overloaded with orders from the Emergency Fleet corporation.

Hard steel bars rerolled from rails had a slack year, due largely to restrictions on building operations, reinforced concrete work being at a low ebb. Another factor in limiting this market was the lack of rerolling rails. Railroads received so few new rails that fewer old rails were released to the scrap market.

Supplied Demand for Hoops

Although the supply of steel available for the purpose was materially curtailed throughout the year, makers of hoops had little trouble in supplying the demand. The government, directly or indirectly, was a fairly heavy buyer, but the demand from regular commercial sources was less than usual, in explanation for which the prohibition wave may be held accountable for the reason that the cooperage requirements were thereby reduced. To some extent, this loss was made good through a larger demand for the making of oil barrels. The government price of 3.50c Pittsburgh, ruled throughout the entire year.

Makers of bands were not satisfied with the government price of 2.90c, Pittsburgh, claiming that it was too low and for that reason made almost no effort to secure business during the early part of the year. In May, the price was raised to the same basis as hoops. Demands were light outside of the government requirements and these were easily satisfied despite a limited production, due to the scarcity of steel.

Normal Needs in Wrought Pipe Set Aside

SO great were the direct and indirect government demands upon the production of wrought iron and steel pipe in 1918 that it was impossible for manufacturers even to partially supply the ordinary commercial requirements. Consequently it is to be assumed that a large banked up tonnage will seek the market during this year. The closing months of 1918, following the signing of the armistice and the rapid and general lifting of restrictions on private consumption of steel, brought out fairly heavy specifications against orders which had been held up on the books of the makers for some months.

Comparatively little new business, however, was coming to the pipe mills when the year ended, for while requirements admittedly were heavy, and stocks throughout the country were badly in need of replenishment, buyers were awaiting lower prices. The fixed discounts on standard steel pipe have been 51 per cent on black and 37½ per cent on galvanized since Nov. 6, 1917.

Fixed Maximum Prices

Black steel pipe, ⅜ to 3 inches, base Pittsburgh	52-5-2½
Steel boiler tubes, 3½ to 4½ in.	34 off
Charcoal iron tubes, 3½ to 4½ in.	12½ off

The operating capacity of the pipe mills did not suffer as greatly as did some of the plants rolling other lines. Because of this condition, jobbers were able to replace sales for essential purposes readily and quite fully, but every ton that left the warehouses for a nonessential use was impossible of replacement until after the signing of the armistice Nov. 11.

Oil country requirements constituted the principal demands and due to the importance of keeping up oil production for the tremendous needs occasioned by the war, such business took a hign priority and preference rating. Since the ending of the war has brought no letup in the pipe demands for this purpose, it is believed that what the jobbers obtained in the late replacements has continued since to go to the oil regions. Distributors, therefore, have no heavy stocks and cannot be as well supplied with other lines because restrictions on shipments were lifted so recently.

Not only is there ahead the replenishment of jobbers' general lines, but the approach of spring is bound to revive new building construction it is thought. Oil well operations must be pursued with increasing vigor for today it is estimated that there is less than 30 days' supply of

Changes in Discounts of Standard Steel Pipe

Date	Sizes in inches	Butt Weld Basing Black	Butt Weld Discount Galv.
Jan. 1, 1910 to Oct. 1, 1910	⅛ to 6	78	68
Oct. 1, 1910 to Oct. 2, 1911	2 to 3	80	70
Oct. 2, 1911 to Dec. 1, 1911	2 to 3	81	74
Dec. 1, 1911 to Dec. 15, 1911	2 to 3	83	76
Dec. 15, 1911 to Jan. 1, 1912	2 to 3	83	76
Jan. 1, 1912 to July 1, 1912	2 to 3	82	75
July 1, 1912 to July 24, 1912	2 to 3	82	75
July 24, 1912 to Sep. 10, 1912	2 to 3	81	74
Sep. 10, 1912 to Jan. 1, 1913	2 to 3	80	72
Jan. 1, 1913 to Apr. 12, 1913	⅛ to 3	80	71½
Apr. 12, 1913 to May 27, 1913	⅛ to 3	79½	71
May 27, 1913 to Aug. 8, 1913	⅛ to 3	79	70½
Aug. 8, 1913 to Oct. 27, 1913	⅛ to 3	80	71½
Oct. 27, 1913 to Feb. 2, 1914	⅛ to 3	80	71½
Feb. 2, 1914 to Apr. 20, 1914	⅛ to 3	79½	71
Apr. 20, 1914 to Nov. 2, 1914	⅛ to 3	80	71½
Nov. 2, 1914 to Feb. 11, 1915	⅛ to 3	82	72½
Feb. 11, 1915 to May 1, 1915	⅛ to 3	80	69½
May 1, 1915 to June 1, 1915	⅛ to 3	79	68½
June 1, 1915 to June 17, 1915	⅛ to 3	79	63½
June 17, 1915 to Aug. 15, 1915	⅛ to 3	79	57½
Aug. 15, 1915 to Nov. 1, 1915	⅛ to 3	79	63½
Nov. 1, 1915 to Jan. 4, 1916	⅛ to 3	78	63½
Jan. 4, 1916 to Jan. 20, 1916	⅛ to 3	77	62½
Jan. 20, 1916 to Feb. 15, 1916	⅛ to 3	76	60½
Feb. 15, 1916 to Feb. 29, 1916	⅛ to 3	75	59½
Feb. 29, 1916 to Mar. 15, 1916	⅛ to 3	74	57½
Mar. 15, 1916 to Mar. 29, 1916	⅛ to 3	73	55½
Mar. 29, 1916 to Apr. 21, 1916	⅛ to 3	72	53½
Apr. 21, 1916 to July 24, 1916	⅛ to 3	70	50½
July 24, 1916 to Sept. 7, 1916	⅛ to 3	70	55½
Sept. 7, 1916 to Nov. 1, 1916	⅛ to 3	69	55½
Nov. 1, 1916 to Nov. 15, 1916	⅛ to 3	69	55½
Nov. 15, 1916 to Dec. 4, 1916	⅛ to 3	68	54½
Dec. 4, 1916 to Dec. 30, 1916	⅛ to 3	66	52½
Dec. 30, 1916 to Feb. 14, 1917	⅛ to 3	64	56½
Feb. 14, 1917 to Mar. 5, 1917	⅛ to 3	62	48½
Mar. 5, 1917 to Apr. 2, 1917	⅛ to 3	60	46½
Apr. 2, 1917 to Nov. 6, 1917	⅛ to 3	55	41½
Nov. 6, 1917 to Jan. 1, 1919	⅛ to 3	51	37½

oil above ground. Natural gas companies in a number of regions are not guaranteeing supplies because of a lack of pipe. It is expected that these gas companies will have to place big tonnages of line pipe by spring. Pennsylvania oil fields have not received extensive supplies of tubular goods during the war for labor has been scarce and the government has seen that supplies have gone to the fields where they would help out most in keeping up production.

The immediate future of wrought iron pipe will be governed not a little by the amount of new building construction, for this, with oil country requirements, provides the principal sources of outlet for this product. Wrought iron pipe producers have suffered little, if any, contraction of production during the war, for the reason that this class of pipe is made from gray forge or low grade foundry pig iron, the use of which in no way interferred with the conserving of steel for vital necessities.

The allotment of steel for steel pipe was kept fairly close at all times to the amount of tubular goods needed for the oil producing sections, ships and for export. But the mills were able to maintain 70 to 75 per cent operations most of the year. When it appeared the war program might suffer for want of steel, production of butt weld pipe was ordered stopped. This order did not become effective until Nov. 1, and was not in force long enough to seriously impair output. It was rescinded Nov. 16.

No review of the situation would be complete without some reference to the good work which was performed by the subcommittee on tubular goods of the American Iron and Steel institute, headed by James A. Campbell, president of the Youngstown Sheet & Tube Co., Youngstown, O., in connection with the allocation of essential orders. When such orders came up for distribution, every manufacturer in the country was provided with the list of requirements and asked to bid on the sizes and specifications each was best prepared to supply. This arrangement worked so perfectly that every need was met and on time.

Metal Markets Yield to War Needs

Normal Distribution and Price Movements Suspended to Insure Full Satisfaction of Requirements of Government and Its Allies—Dissimilar Methods of Regulation Carried Out in Copper, Lead, Spelter and Tin

WITH the beginning of 1918, the nonferrous metal markets were fairly started on the era of price fixing and government control. Most of the metals had been greatly stimulated by the demands created by the war prior to the entrance of this country into hostilities. But with the great army, navy and shipping programs laid out by this government, and with the continued needs of the European allies, it became necessary both from the standpoint of supplies and of labor, to curtail consumption of most of the metals except for war purposes. Consequently, business was diverted from normal channels. Middlemen largely were eliminated. Speculation was abolished, except to an insignificant extent and prices were held within bound. The large producers cooperated loyally with the government and war supplies always were forthcoming. As 1918 closed, the various metal industries rapidly were being freed of government restrictions, most of the agreements terminating automatically Jan. 1.

In fixing prices, the war industries board stipulated four important conditions, as follows: (1) Producers must not reduce wages; (2) operators must sell to the public and to the allied governments at the same prices paid by the government; (3) they must take such measures as necessary to keep metal from falling into the hands of speculators who would increase the price to the public; and producers must pledge themselves to exert every effort necessary to keep up production to the maximum, so long

Fixed Maximum Prices

NONFERROUS PRODUCTS

Jan. 1 to July 2	
Electrolytic copper, carloads	23.50c
July 2 to Jan. 1	
Electrolytic copper, carloads	26.00c
March 5 to June 1	
Aluminum ingots	32.00c
June 1 to Jan. 1	
Aluminum ingots	33.00c
Feb. 15 to Jan. 1	
Grade A spelter, St. Louis	12.00c
Sheet zinc, f.o.b. plant	15.00c
Plate zinc, f.o.b. plant	14.00c

Average Monthly Nonferrous Prices in 1918

PROMPT, WHOLESALE LOTS, CENTS PER POUND, NEW YORK, UNLESS OTHERWISE STIPULATED

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Copper*	23.50	23.50	23.50	23.50	23.50	23.50	26.00	26.00	26.00	26.00	26.00	26.00
Lead†	6.636	6.956	7.25	7.25	7.09	7.498	8.03	8.05	8.05	8.05	8.05	.....
Spelter††	7.734	7.740	7.508	7.508	6.81	7.79	8.41	8.67	9.28	8.64	8.40	.....
Aluminum	38.09	38.191	32.00	32.00	32.00	32.00	32.00	32.50	33.00	33.00	33.00	.....
Antimony	14.295	13.845	13.054	13.05	12.65	12.87	13.15	13.73	13.00	13.16	9.10	.....
Tin‡	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

*Lake and electrolytic.
†Prices fixed by agreement among producers from July 7 to Dec. 31.
††Prime western, St. Louis basis.
‡No tin averages because of uncertainty of market during most of year.

as the war lasted. The general policy of price fixing of copper, aluminium, high grade spelter, sheet zinc, plate zinc, and lead embodied these principles.

Copper, the first nonferrous metal to be regulated, was fixed at a maximum of 23.50c for carload lots Sept. 21, 1917. This continued until June 1. On May 22 producers met with the price fixing committee of the war industries board and agreed to the continuation of the 23.50c price for 75 days to Aug. 15. However, unexpectedly, July 2, the war industries board announced an advance to 26c, effective at once. This aroused considerable protest from consumers who had made contracts for their products based on the 23.50c price in view of the announced continuation of that level to Aug. 15. The 26c price was in effect Nov. 11, when the armistice was signed. Producers at a meeting with the war industries board shortly after that date agreed to continue this price to Jan. 1. While hostilities still were in progress, the maximum price was not shaded in any prime grades. Shortly after the armistice was signed, casting was offered down to 23c.

Distribution was supervised by the copper producers' committee, under the war industries board.

Brass Shortage Large

A large amount of the output of copper was consumed by the brass mills. The brass industry operated under a heavy handicap as regards labor during most of 1918. About midsummer, the draft and high wage war industries had drawn so heavily upon the brass mills, that they were able to operate at only about 60 per cent. On Aug. 29 figures compiled by the brass section of the war industries board showed demands of the war department for sheet brass of about 3,320,000 pounds a day, against actual production of 1,800,000 pounds, leaving a shortage of 1,460,000 pounds daily. The shortage of rod brass was about 140,000 pounds daily. The brass industry was placed on a strict priority basis in October, 1918.

The brass industry used large amounts of spelter, but galvanizing business was extremely dull. Production of galvanized sheets was at about 30 per cent of normal. The spelter market was weak during most of the year and when the armistice was signed had pretty effectually discounted the coming of peace. Opening the year at 7.75c, East St. Louis base, prime western advanced to around 9.50c in September and closed the year at about 8.25c. It was not necessary for the government to fix the price of the lower grades to insure a full supply at a fair price. Supplies were so adequate that some departments of the government took interest in assisting the development of consumption of spelter in other fields, to replace metals more badly needed in war work. On Grade A spelter a maximum price of 12c was fixed Feb. 15, which was still effective Jan. 1. A maximum base price 15c on sheet zinc and of 14c on plate zinc, were fixed Feb. 15 and continued throughout the year. Prior to price fixing, Grade A spelter had been selling at about 15c, sheet zinc at 19c and plate zinc at 18c.

The war industries board fixed a base price of 32c on aluminum March 5, on 50-ton ingot, lots analyzing 98 to 99 per cent. The customary differentials for sundry grades, quantities and shapes were retained. The open market prior to the fixing was about 39c. The bulk of the country's output went into war work.

Control of lead was effected somewhat differently than in other metals. The war industries board did not formally fix a price, this being accomplished by a committe of all the producers, known as the lead producers committee for war service. The shortage of lead for war services was threatening in the spring of 1918 and the committee took steps, by agreement in the industry, to forestall any need of government interference. In July a price of 8.05c, New York, 7.75c, East St. Louis basis, was established, producers refusing to sell to speculators, and accepting allotments for direct government work, through the producers committee. This control was extended so that the committee had entire charge of all distribution. The 8.05c maximum price still was effective when the armistice was signed, but on Dec. 2 the committee announced a reduction of 1c to 7.05c, New York, 6.75c, East St. Louis. Following this announcement prices slumped.

Price of Tin Controlled

Tin was the subject of much agitation. On Nov. 16, 1917, the war trade board approved regulations covering pig tin, chloride of tin and tin ore, under which the American Iron and Steel institute was to act as consignee for all importations. All consumers, jobbers, importers and dealers, were required to apply to the war trade board for licenses. Private importers continued to bring in tin for the requirements of the general domestic trade. However, the market rose rapidly during the year, from around 75c on Jan. 1, to $1.10 for Straits tin on May 10, 1918. In the meantime, steps were taken to control the price of tin. An interallied control was instituted and an interallied executive was established in London. This control was to fix the price by centralizing buying power and eliminating buying competition. Importing agents were named to act for each of the allied countries. In this country the agent named was the United States Steel Products Co.

The Steel Products Co. financed allocations made to this country by the interallied executive and supervised distribution, at cost of importation, under the regulation of the war industries board. The products company purchased tin as allocated, up to Dec. 1, spending about $16,000,000. A price on this tin was announced Dec. 3, at 72.50c, New York and Chicago, 71.25c, Pacific coast port, for December and January delivery.

Scrap Reflected War and Peace

Unusual Conditions in the Old Material Industry Grow Out of a Year of Regulated Prices, Classification and Distribution—Market Robbed of Life by Elimination of Speculative Factor

MANY unusual events were crowded into the iron and steel scrap market in 1918. Something of a disturbing nature was in evidence almost all the time and opened many new paths for this branch of the trade to travel.

Even the weather was against activity and this was the first big obstacle of the year. Storms in January paralyzed transportation and prevented a free movement of scrap in transit. The same difficulties of transportation that hampered scrap also cut down its consumption markedly by limiting the activity of steel mills and foundries, which were short of fuel. Effects of this interference of normal conditions continued until late in February before consumption and free movement of material already on cars began to clear the situation. Many embargoes were placed by railroads in addition to that imposed by snow and cold. The congestion of rail lines in the east was felt severely. In February further fixing of prices tended to unsettle conditions and add uncertainty, always a bar to active dealing. In addition the plan of naming maximum prices for three months caused an inactive period toward the end of each quarter, when dealers and consumers refrained from buying for the future. Labor was short throughout the year and wages were high, hampering yard operation and limiting the tonnage of prepared scrap available for free movement. When freight rates were advanced sharply at the middle of the year, another pause followed while the situation was being clarified. Inasmuch as price fixing provided that the quotation include delivery at consuming point, this advance fell on the seller and thus restricted trading. The seller preferred to sell for delivery at the nearest possible point to avoid the transportation item. Late in the year the government absorbed most of the oxygen and acetylene gas produced in the country, for war uses, and scrap yards were unable to obtain a supply for cutting up boilers and tanks and other material not possible of shearing.

With a fixed price and a stipulated commission paid by the consumer to the dealer for obtaining his scrap, the speculative element, usually the life of the scrap trade, was almost eliminated. Payment of the commission also had the effect of causing more direct dealing than usual. The railroads marketed a larger proportion of their offerings direct to consumers than in normal times. This further restricted the activity of the usual lines of trade. This was especially noticeable in direct transactions involving car wheels. This grade of scrap scarcely appeared in the market through the year, though there was heavy demand for it for foundry use. Most wheels went direct to wheel foundries to be converted into new product. The railroad administration in an effort to find metal for wheel manufacturers instructed railroads to use every effort to dismantle all cars ready for that operation, in order to get the wheels into

Fixed Maximum Prices

Jan. 1 to April 1

No. 1 heavy melting steel	$30.00
No. 1 railroad wrought	35.00
Cast iron borings	20.00
Machine shop turnings	20.00

April 1 to Jan. 1

No. 1 heavy melting steel	$29.00
No. 1 railroad wrought	34.00
Cast iron borings	19.00
Machine shop turnings	19.00

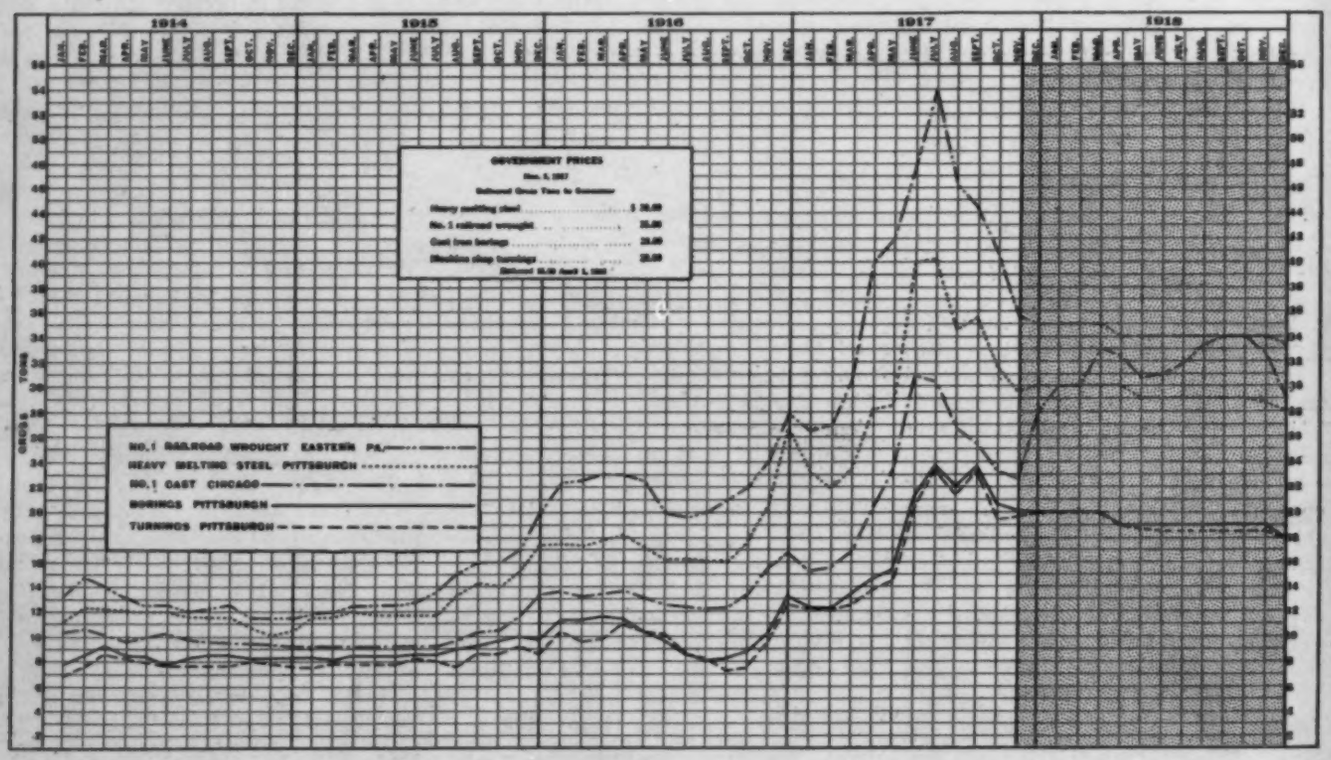


CHART OF AVERAGE MONTHLY PRICES ON LEADING GRADES OF SCRAP 1914-1918

use and relieve the shortage of metal.

A general shortage of nearly all grades was present more or less all year. The supply never was much in excess of the demands of consumers and most of the time it was far less. Strenuous means were employed to increase the supply and the government resurrected about 40,000 tons of steel along the Panama canal, left from the days of French construction. This was to relieve the scarcity in eastern sections. During the year shell turnings and rejected shells began to appear in important tonnages as the government's war program expanded. The virtual elimination of this class of scrap also came within the year as the production of shells was reduced with the approach of peace. Lack of sufficient tonnage of usual grades to fill needs of steel mills forced the use of substitutes and so keen was this condition that mills were willing to accept these substitutes at full price on contracts for heavy melting steel. Bundled sheet scrap and other grades applicable to open-hearth use but ordinarily not used except at lower price, were taken freely at times to eke out the necessary tonnage for steelmaking.

In October the sensitive scrap market felt the approach of peace more keenly than other departments of the steel industry and softness appeared in all grades except those used in the production of steel. Prices declined and buying almost stopped in rolling mill and foundry grades. Rerolling rails began to appear magically in better tonnage, just at the time when rerolling mills had little demand for bars and would not buy rails. Another soft period was experienced preceding the reduction of $1 per ton on all grades in March and quotations declined about that amount before the price was changed. Thus the entire year has presented a series of obstacles tending to slow trading and interfering with an even trade. It forms a historic period, like which nothing has been seen in the past and to which the future may carry no parallel. The era of price fixing is almost entirely embraced within the 12 months of 1918. This unprecedented condition has contained much of value in teaching both the scrap industry and the steel industry in general the importance of old material as a raw necessity.

One of the important features has been the increasing control over its activities exercised by the government through the American Board of Scrap Iron Dealers. The new dignity given the scrap industry by the first announcement of price fixing Nov. 5, 1917, was enhanced by subsequent extensions of this control. The original announcement covered heavy melting steel, borings and turnings and No. 1 wrought and it was supposed these base grades would dictate the maximum on related grades. Practice having proved otherwise, the steel and steel products committee of the American Iron and Steel institute appointed a committee of scrap men to formulate a more comprehensive classification and this was announced Dec. 27, 1917. This did not please the trade, either dealer or consumer, and the matter was taken up again after much protest had been made and a new and larger committee was named. This body announced a further schedule Feb. 21, 1918.

Reduction in Price

The only change after that announcement was a horizontal reduction of $1 per ton on all grades March 26, effective April 1, at the same time pig iron was reduced by an equal amount. When the $1 was restored on pig iron in September, scrap was left at the lower level. When the first price regulation was announced, provision was made for a commission of 3½ per cent to the dealer. This afforded the latter the opportunity to make a profit when he paid the maximum price. In the Feb. 21 announcement no mention was made of the commission and it was not until May that the war industries board restored the commission and in the meantime trading was much restricted in some grades.

With the weakening of prices along toward the middle of November—the complement in the scrap industry to the signing of the armistice—the commission gradually began to disappear. Dealers were enabled to procure supplies at prices under the government maximums, and thus were not dependent for a profit upon the 3½ per cent allowance.

Power was given the board of scrap iron dealers to control the distribution of scrap and under this authority shipment from one consuming district to another was not allowed except on special permits, issued after the need had been shown sufficiently. In this way scrap produced in certain sections was available for consumers there and could not be shipped away unless other districts could prove a greater need. In such cases as shipments were permitted the consumer paid the freight in addition to the price of the scrap and the commission. Permits were issued sparingly and little material moved in this way.

A feature of the schedule issued in February was the fact that prices were fixed on many grades in accordance with the use to which the scrap was to be put, to maintain an equality of price on all material used for the same purposes. The classification on low phosphorus scrap is an illustration. Three grades were provided, with maximums of $39, $36.50 and $34 for use in acid open-hearth furnaces but when sold for use in basic open-hearth furnaces not more than $29 could be paid. Cast scrap for use in puddling furnace and cupola was allowed an advance of $5 over the price of heavy melting steel, but for use in the open-hearth, the price was not allowed to exceed that of heavy melting steel. The purpose of these regulations was to prevent consumers obtaining an advantage by paying the higher price allowed for any grade, when it was to be used for another purpose. It kept the classification uniform. As a result of this provision, some producers exacted of dealers a statement as to the destination and use of scrap they offered for sale. Inasmuch as the maximum price applied f.o.b. consuming point, it had to absorb freight and the government war tax on freight charges. This provision had the effect of limiting the distance to which scrap could be shipped and when a seller had the choice of two delivered points in disposing of his material, he naturally sold to the nearer, as this gave him the largest net return. This effect was seen most clearly in the selling of railroad tonnages. The dealer or consumer located on the line of the road offering the scrap had the first call, since to ship it to a point on another line involved payment of further freight, thus reducing the realized price. It was to make possible certain exceptions to this rule that permits were provided in case of emergency. The buyer in such cases was allowed to pay the additional freight, thus in effect increasing the total cost beyond the maximum figure. This permission was allowed only in extreme cases where material was sorely needed and was unobtainable nearby.

Not the least of the new features which 1918 brought to play in the scrap iron and steel trade was the nation-wide adoption of the gross ton as the standard. Previous to the promulgation of the first fixed prices on scrap, Nov. 5, 1917, both the net and the gross ton had their following, and in the same market one grade would be sold on the basis of a net ton while another would by agreement be priced gross. Conversion tables were laid aside with the adoption of the standard gross ton of 2240 pounds, and throughout the year all prices were understood to be on that basis. This is one reform that many dealers hope will continue after the war.

Structural Steel Absorbed by War

Production and Distribution in 1918 Determined Exclusively by Government's Requirements—Shape Mills Devoted to Production of Shell Steel—Many Operating Difficulties Encountered—Shops Help to Build Ships

PRODUCTION and distribution of structural steel during 1918 were determined exclusively by the needs of the government. Consumption was restricted through the medium of the war industries board almost entirely to war requirements. Despite this restriction the total volume of fabricated work placed during 1918 was but little less than the totals for each of the three years preceding and surpassed that for 1914. Production of plain shapes might have been much larger than it was during the year. Owing to the tremendous demand for other finished products, however, the output of shapes was limited to the essential needs, thus conserving the supply of semifinished steel.

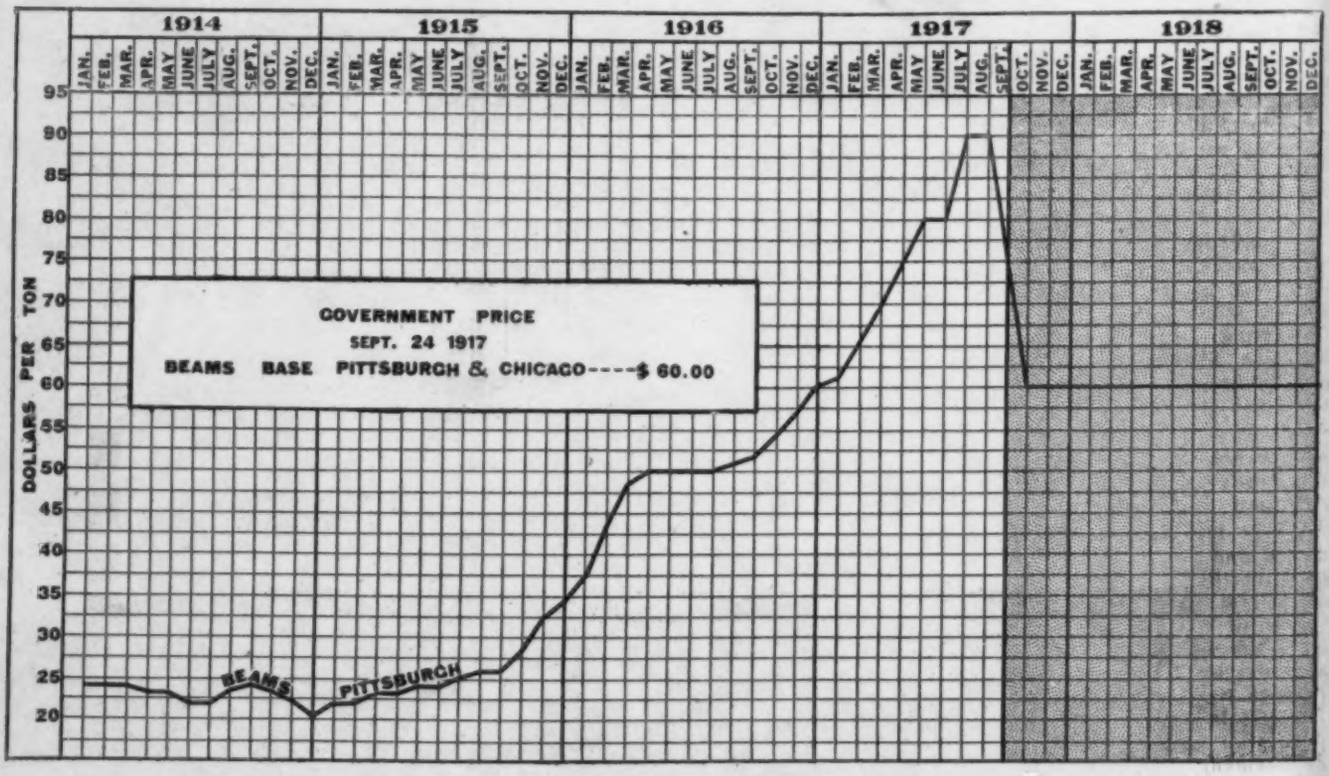
Many shape mills during the year were devoted to the production of shell steel. Those shape mills which were devoted to their usual product, however, at all times were congested with orders. For the first three months of the year the congestion of the railroads prevented them from obtaining enough fuel, pig iron and other materials to sustain operations. During that period production at various mills at various times ranged from 30 to 75 per cent of capacity. In the fall operations were badly crippled over a period of weeks by the influenza epidemic.

Curtailment of nonessential structural business became quite general early in the year and proceeded from two principal causes. One was the attitude of the government in discouraging building projects which were not needed in the prosecution of the war, thus conserving labor and materials for essential work. The other was the steadily mounting cost of construction, making prospective builders hesitate.

Early in May the shape mills, with the other steelmakers, were asked to obligate themselves to supply 100 per cent of their output to the government.

The obligation which the shapemakers assumed at that time was maintained so religiously by them that they went to the extent of melting overlength sections and keeping for future government orders material not previously specified on such requisitions. Therefore, no shapes thereafter went into consumption unless by the rulings of the government.

The problem of supplying steel to fabricators and jobbers was solved with difficulty by the war industries board. In July such buyers were given the privilege of ordering stock replacements under a B-4 priority rating which applied not only to new orders but to those already on the books of the mills. As a result the mills were able to give a definite place in their schedules to orders which previously had been lying dormant and they were able to book new replacement orders. Under the B-4 rating fabricators were able to place orders for one-sixth of the total tonnage they had shipped over the first six months of the year with the understanding that each month thereafter they were to be permitted to place tonnages equivalent to their shipments during the preceding month. It did not take long, however, to demonstrate that the B-4 classification was of very little value, owing to the huge amount of steel covered by superseding ratings. As a result a special A-6 classification later was provided for emergency use. Early in October the prevailing system was



STRUCTURAL SHAPE PRICES SINCE 1914. SHADED PORTION REPRESENTS PERIOD OF GOVERNMENT CONTROL

The desirability of Agathon Quality is felt most strongly when that quality is most needed.

In times of unusual stress and strain.

AGATHON
ALLOY STEELS

Agathon Types plus Agathon Quality

will save both you and the user of your products much worry by eliminating 95% of the possibility of failure.

Let us consult with you regarding your needs.

The Central Steel Company

Massillon, Ohio

Cleveland Office—Hickox Bldg., The Hammill-Hickox Co., Dist. Reps.
Chicago Office—1370 Peoples Gas Bldg., 122 S. Michigan Blvd., C. H. Beach, Dist. Sales Mgr.
Detroit Office—326-27-28 Ford Bldg., F. Walter Guibert, Dist. Rep.
Export Office—20 Broad Street, New York, N. Y.
Philadelphia Office—603 Widener Bldg., Frank Wallace, Dist. Sales Mgr.
Syracuse Office—621 University Block, T. B. Davies, Dist. Sales Mgr.

changed entirely. The B-4 automatic priority rating for replacement orders was withdrawn and fabricators were requested to apply for priority cer- of structural steel.

Requirements of a widely diversified character were represented in the huge tonnages placed by the government or allocated by the government.

By far the major portion of the activities of the shape mills and the structural fabricators, however, originated in the huge requirements of the Emergency Fleet corporation. Tonnages which were awarded by the Fleet corporation reached enormous proportions almost each month and they supplied the backlog for the operations of the mills and fabricating shops. During the early part of the year the mills and fabricators were allowed to some extent to follow their own initiative in shipping steel to shipyards. Many difficulties arose out of the lack of an ideal distribution system with the result that shipyards in most cases had supplies of some parts on hand sufficient to last them for months while actual progress in the construction of ships was delayed by the lack of steel for other parts. By the new system which was perfected about the middle of the year each shipyard relies upon certain and nearest mills and fabricating shops for its requirements.

The experience which was gained in fabricating steel for use in shipbuilding resulted in November in the formulation of a code of standard sections and practice to govern the fabrication of ship steel. The code later is to be amplified by the additions of heavier sections which will be used in larger boats. Such large tonnages were involved in the fabricated ship steel contracts placed by the Fleet corporation during 1918 that toward the close of the year it was estimated the fabricators doing the work would not complete their tonnages until the first half of 1919.

All shape mills throughout the year strictly observed the agreed maximum base price of 3c, Pittsburgh, on plain structural shapes. The only exceptions were on export sales and these involved comparatively small tonnage. Early in the year before government control of distribution had been applied to the entire market occasional small tonnages were booked from abroad at premiums of ½ to 1½ cents over the domestic price, but for indefinite delivery.

In the latter part of September the war industries board asked the shapemakers to limit their shipments exclusively to orders having A priorities. The mills closed 1918 with large tonnages on their books, and with assurances that there would be no paring down of the Emergency Fleet corporation's program. Shortly after the armistice was signed and the government's restrictions removed views regarding the market's future were reflected in miscellaneous export sales at 3.50c to 3.75c, Pittsburgh, or ½ to ¾ cent above the domestic market. The year closed with offerings of shapes for first half delivery at 2.80c, Pittsburgh, the price recommended by the general committee of the American Iron and Steel institute effective Jan. 1.

Structural tonnage awarded monthly, as compiled by the Bridge Builders and Structural society was as follows:

	1918	1917	1916	1915
Jan....	95,400	119,000	119,000	43,000
Feb....	99,900	106,000	129,000	51,000
March..	84,600	122,000	175,500	110,000
April..	115,200	110,000	125,000	107,500
May...	108,000	102,000	137,000	150,000
June...	100,800	85,500	100,000	138,000
July...	209,700	74,700	83,600	148,000
Aug...	102,000	68,400	110,000	146,000
Sept...	108,000	52,200	99,000	115,000
Oct....	77,400	110,700	133,500	134,000
Nov....	48,700	138,600	134,000	180,000
Dec...	25,000*	205,200	148,000	208,000
Total	1,174,700	1,294,300	1,493,600	1,485,000

*Estimated.

Steel Rails in Great Demand During Year

DEMANDS for steel rails were of tremendous proportions during 1918, but there were relatively more important uses for steel in other finished forms. As a result rail output was not as large as it otherwise would have been. Many of the rail mills were employed a great portion of the year in the production of shell rounds. Only the most urgent rail requirements were permitted to occupy the attention of the makers. These included principally the tonnages which were needed in connection with the military railroad in France. In May General Pershing cabled an order for 100,000 tons of 80-pound rails. Part of this order, 76,000 tons, was filled with 61½-pound sections originally rolled for the Russian government but not shipped. The remaining 24,000 tons was rolled from bessemer steel by the Cambria Steel Co.

In August rail orders aggregating 200,000 tons for the military roads in France were allocated as follows: One hundred and twenty-seven thousand tons to the United States Steel Corp., 25,000 tons to the Bethlehem Steel Co., and 16,000 tons each to the Lackawanna and Cambria Steel companies and the Colorado Fuel & Iron Co. In October orders for another 380,000 tons of bessemer rails for General Pershing's forces were distributed to the same makers.

Inquiries for rail tonnages abounded in the market early in the year, but the books of the makers already were so clogged with orders that they hesitated to take on any new business whatsoever.

Control Restricts Requirements

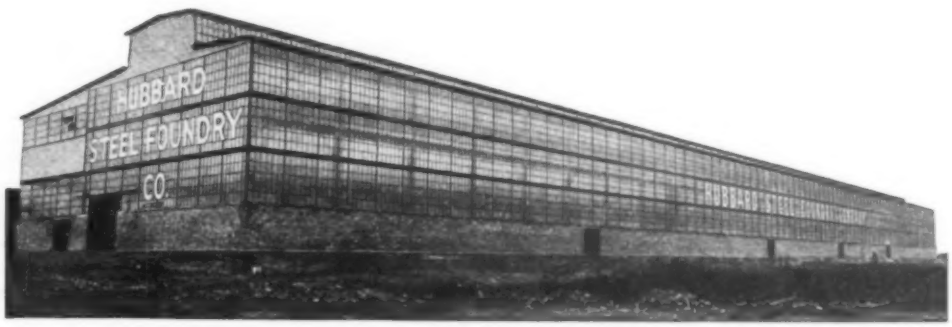
Efforts by the railroads to buy rails undoubtedly would have been more active had the roads not been under federal jurisdiction. In the second half Mr. McAdoo ordered the mills to make shipments of rails on old low-priced contracts, but in many cases to roads other than those which originally made the contracts.

Railmakers were disappointed over the delay which marked the attitude of the government in determining prices on rails. On numerous occasions they were called to Washington to discuss the subject but without any action resulting. It was not until December that the government agreed to apply to contracts placed by the army and navy the figures which early in the year were recommended by the makers. These prices were $57, mill, for open hearth rails and $55 for bessemer rails. Although these figures were quoted by leading makers all through the year on the requirements of the major roads, some business was done at higher prices. Small tonnages in January and February were sold to traction companies, cranemakers and other industrial users at $75 to $80 at the mill. Later small lots were sold to consumers of this character at $60 to $65.

The war industries board in October, however, requested railmakers not to sell any more second quality rails without first submitting a list of them discards. The price on light rails which was established by agreement with the government in 1917 was 3c at the mill and this price was quoted by all makers. Large quantities of

Export inquiry featured the market all through the year and several good sized tonnages including one lot of 50,000 tons, were sold for shipment abroad in 1919. Generally, however, the huge requirements of the government and the uncertainty as to when deliveries could be made prevented makers quoting on export inquiries.

SPEEDING with ROLLING MILL JIM



Say Fellows! you remember the first of March I told you the "Hubbard" broke ground for a new foundry? Well here's a picture of her, she started with a BANG, June 3rd. Just 93 days! She has ***some*** up-to-date equipment in her, installed by ***some speed artists,*** I'll say: electric furnace, open hearth furnace and all that swell stuff. Pike her off for yourself!

So long,

Rolling Mill Jim.—

Hubbard Steel Foundry Co.

EAST CHICAGO, IND.

All Kinds of Iron and Steel Rolls and Steel Castings.

Ferroalloys Production Stimulated

Greatest Impetus Ever Given to Industry in This Country Resulted from War-Time Demands—Development of Manganese Deposits Pushed on Large Scale —Production of Spiegeleisen Also Aided

SCARCITY of ocean tonnage, due to the submarine menace and the great need of supplying the allies and for transporting our troops and war materials to France, had a far-reaching effect on developments in the ferroalloy markets during 1918. In prewar days the iron and steel industry of this country depended on foreign sources for a large portion of its supply of ferroalloys. When this country entered the war, it not only became necessary to provide much larger supplies of these metals than usual to support steelmaking capacity, but it was essential that this increase in the supply should be accompanied by the least possible demand upon ocean shipping space. It was this basic situation which resulted, in 1917, in the formulation of well-defined plans for making the United States independent, as far as possible, of foreign sources. The carrying out of these plans in 1918 led to the greatest stimulation in ferroalloys production that this country ever has known.

The situation generated by the shortage of ocean tonnage led to particularly significant developments in ferromanganese. In past years nearly all the ferromanganese used in this country was imported or was produced here from ores brought in from abroad. It was the necessity not only for stimulating production, therefore, but for basing the production upon the smallest possible use of foreign ore that confronted American producers in 1917. To meet the demands of the situation old blast furnaces which had been idle for years were put into operation and there ensued an unprecedented interest in domestic manganese ore deposits. Development of these deposits was pushed on an extensive scale with the result that production of manganese ore became an important industry for the first time.

Ferromanganese and spiegeleisen could not be produced from the lean domestic ores as a base with as many units of manganese as customarily marked the production from high-grade foreign ore. It therefore was requested by the government that the number of units in standard metal be reduced. In April the subcommittee on ferroalloys of the American Iron and Steel institute recommended that thereafter both buyers and sellers recognize 70 units as the standard for ferromanganese and 16 units as the standard for spiegeleisen. This recommendation met with the unanimous approval of the steel industry. The new standards were substituted for the old in contracts previously booked, on the basis of an equal number of manganese units, and were specified in new sales. Exceptions were made only in the case of manganese steelmakers and other users whose metallurgical requirements necessitated the use of metal containing higher percentages than the new standards. The new standards were continued in effect until the end of the year.

Prices on ferromanganese at the beginning of the year averaged $250, delivered, for all positions, and the makers generally had enough business on their books to take up most of their output over the first three to six months. In some cases $240, delivered, was done on contracts made during January, but in general the level of $250 was maintained over the first two months. Early in March large sales were made both at $250 and $245. In April makers advanced their prices to $275, delivered, for 80 per cent metal, quoting $250 for 70 per cent. The $250 quotation established on 70 per cent in April was maintained by the producers throughout the remainder of the year.

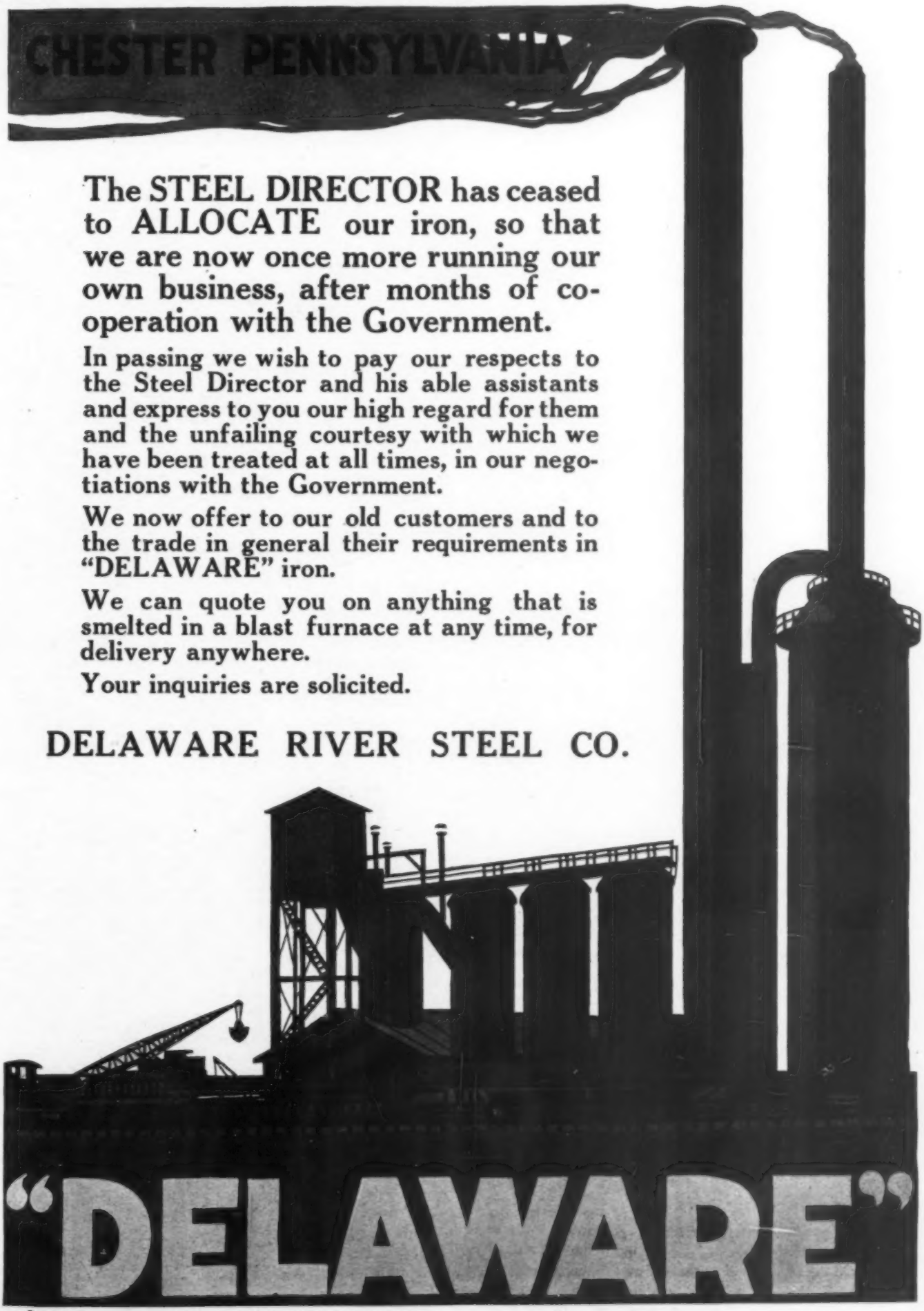
James A. Farrell, chairman of the subcommittee on ferroalloys, issued an announcement in July calling attention to the fact that it was necessary for the ferromanganese makers to contract far in advance for their supplies of ore and that if they were to be expected to continue this policy the disposition of their output must be assured. Mr. Farrell's announcement resulted in a buying movement during which practically all of the consuming trade closed for its requirements up to the end of the year and in many cases beyond.

Although the $250 price was maintained to the end of the year by producers consumers indulged in some reselling in November and December at prices ranging from $230 to $240, delivered. In the early months of the year numerous round tonnages of English ferromanganese were offered and sold. In May the war trade board issued a prohibition against imports of ferromanganese and spiegeleisen excepting overland by way of the Great Lakes from Canada or overland from Mexico. Later in May the war trade

Imports and Domestic Production of Manganese Alloys; Imports of Manganese Ore

	Production		Imports		Imports
	Ferro-manganese	Spiegeleisen	Ferro-manganese	Spiegeleisen	Manganese ore
1918	*405,955	*294,869	*25,368	.....	*506,382
1917	328,000	187,000	51,800	.....	663,500
1916	275,204	187,233	90,928	.....	576,351
1915	144,260	114,556	55,263	200	313,985
1914	100,731	76,625	82,997	2,870	283,294
1913	119,495	106,980	128,070	77	345,090
1912	125,378	102,561	99,137	1,015	300,661
1911	74,602	104,013	80,263	30,970	176,852
1910	71,376	153,055	114,228	25,383	242,348
1909	82,209	142,831	88,934	16,921	212,765
1908	40,642	111,376	44,624	4,579	178,203
1907	55,918	283,430	87,400	48,994	209,031
1906	55,520	244,980	84,359	103,268	221,260
1905	62,186	227,797	52,841	55,457	257,053

*Estimated.



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In passing we wish to pay our respects to the Steel Director and his able assistants and express to you our high regard for them and the unfailing courtesy with which we have been treated at all times, in our negotiations with the Government.

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board as a result of a recommendation by the subcommittee on ferroalloys agreed to the importation of 12,000 tons of English ferromanganese which previously had been contracted for.

Prices on foreign manganese ore during the year were determined largely by the ocean tonnage situation. In view of the vessel scarcity which prevailed early in the year sales of Brazilian ore were made at $1.30 per unit, c.i.f. tidewater. In January, an embargo against the shipment of ore from the mines to the Brazilian coast was announced by the government of Brazil owing to the shortage of coal in that country so that prices moved up to $1.35 to $1.40, at which figures sales were made here in the second half of January. In February and March sales of Brazilian and some moderate tonnages of Indian ore were made at $1.30 and $1.35 per unit. The market continued at this level until October when coal shipments began to go forward to Brazil in sailing vessels. Owing to the fact that these vessels became available for bringing back manganese ore on their return trips the market was flooded with offers, and a good many thousands of tons of Brazilian ore were sold at $1.20 per unit at tidewater. Much lower figures were offered later in the year.

Spiegeleisen production was stimulated during the year in the same way as ferromanganese, and the same efforts which led to the revision in the number of units in standard ferromanganese brought about a reduction in standard spiegeleisen from 20 to 16 units. Buying in January was done on the basis of $60, furnace, for forward requirements, while some producers were obtaining $61.50 for spot.

In the latter part of January one large eastern maker advanced to $75, furnace. In February, there was a very large buying movement at $57.50 to $58 for contract and $60 for spot. By the middle of March very few of the makers were willing to shade $65. Following further heavy sales makers advanced to $70 at the furnace while in the latter half of March in response to the recommendation for a 16 per cent standard the price of $70, furnace, was applied to 16 per cent metal.

In May the market generally was quoted at $75 for spot 16 per cent metal and $70 for second half. At that time it had become more difficult temporarily to obtain spiegeleisen than ferromanganese. In the middle of May sales of spot 16 per cent were made at $75 to $77, furnace, while futures commanded $70. On sales of metal containing more than 16 per cent it became customary to charge $3.50 for each additional unit. In June the minimum for second half contracts was raised to $75, and later in June the falling off in demand resulted in the disappearance of premiums for spot. Very little buying featured the market thereafter until the issuance of Mr. Farrell's letter to the trade urging the necessity for forward buying. Sharp shading of the $75 price occurred in September in connection with contract buying, but this figure later was re-established and maintained until the middle of November when 16 per cent metal sold at $70, furnace.

Good Demand for Ferrosilicon

Good buying featured the 50 per cent ferrosilicon market during the year. Contracts in January were quoted at $160 to $170, while spot metal, by reason of a scarcity, brought $175, delivered. In February spot sales were made at $175 to $180, delivered, and contracts at $170 to $175. A disposition to keep prices within reasonable limits led to a break in the market in the latter part of February. At that time, while spot metal continued to bring $175 to $180, and in some cases much higher, contracts for deliveries over the remainder of the year were made at $155. In March contract sales were made at $150, delivered, and there was a softening in the spot market until both spot metal and contracts in June were to be had at $150 to $160. In August there were sales at $147.50 to $150. During the last quarter of the year metal for spot delivery brought premiums of $5 to $10 a ton. In the latter part of October the spot market was around $157 to $160, delivered, while makers quoted $150 to $155 on contracts. A large volume of inquiry was in the market from steelmaking consumers, part of which was closed just before the armistice.

Considerable interest was shown in the ferromolybdenum market during the year, but this interest was largely of an experimental character. Transactions in ferromolybdenum and molybdenite in the open market were few, although some middle western steelmakers figured tentatively on requirements for special steelmaking. Manufacturers of ferromolybdenum asked from $4 to $4.50 a pound, contained molybdenum, 60 to 70 per cent, early in the year, but toward the close of the year they had reduced their asking prices to around $3 to $3.50. Molybdenite in the open market was quoted at the year-end nominally about $1 to $1.25 a pound.

Ferrotungsten early in the year sold at $2.20 to $2.30, furnace, per pound of tungsten contained. Prices advanced until in October sales of standard 75 to 80 per cent ferrotungsten were made for fairly early delivery at as high as $2.75, per pound contained, at the furnace, and alloy for spot delivery was almost unobtainable. The market for 72 per cent alloy then was quoted at $2.60 to $2.70, furnace. After Bulgaria, Turkey and Austria-Hungary withdrew from the war, prices began to decline. Sales were made just prior to Nov. 11, at about $2.50. After the armistice with Germany was signed, prices dropped to $2.40 a pound contained and closed the year at around $2.30 to $2.35.

Ferrochrome opened the year at around 50 cents per pound for spot 60 to 70 per cent metal containing 4 to 6 per cent carbon, and at 35 cents for metal containing 6 to 8 per cent carbon. During the spring months there was a falling off in the premium for the higher grade metal and during May sales of 4 to 6 per cent were made at 40 to 45 cents while 6 to 8 per cent continued to bring 35 cents. Later in the year it was possible to obtain 4 to 6 per cent metal at 40 to 42 cents. The contract price on 6 to 8 per cent metal early in the year ranged from 31 to 34 cents, while the contract price at the end of the year had advanced to 35 cents.

Average contract prices of ferromanganese at seaboard during 1916 and previously, and delivered during 1917 and 1918, are as follows:

	1918	1917	1916	1915
January	$250.00	$175.00	$110.00	$68.00
February	250.00	192.50	140.00	100.00
March	250.00	212.50	175.00	100.00
April	250.00	250.00	175.00	100.00
May	250.00*	375.00	175.00	100.00
June	250.00*	400.00	175.00	105.00
July	250.00*	400.00	175.00	103.00
August	250.00*	387.50	170.00	105.00
September ...	250.00*	380.00	164.00	110.00
October	250.00*	300.00	160.00	105.00
November	250.00*	247.50	155.00	100.00
December	250.00*	247.50	162.50	100.00

*Prices prior to May, 1918, were based on 80 per cent ferromanganese. Succeeding prices were based on 70 per cent metal.

Average monthly prices for spiegeleisen for the past four years are as follows:

	1918	1917	1916	1915
January	$59.00	$57.50	$32.50	$25.00
February	59.00	66.25	42.50	25.50
March	65.50	77.50	55.00	26.00
April	70.00*	76.75	60.00	26.00
May	71.00*	78.00	60.00	26.00
June	75.00*	83.00	55.00	26.00
July	75.00*	85.00	47.50	26.00
August	75.00*	81.25	47.50	26.00
September	75.00*	80.50	45.00	29.00
October	75.00*	73.50	40.00	30.00
November	75.00*	69.25	45.00	30.00
December	72.50*	60.00	50.00	30.00

*Prices prior to May, 1918, are for 20 per cent spiegeleisen. Prices for May, 1918, and succeeding months apply to 16 per cent metal.

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SANDUSKY, OHIO

Average Monthly Prices of Pig Iron, Rolled Products and Old Material in Principal Districts in 1918

Average Monthly Prices of Leading Materials at Pittsburgh

PIG IRON:	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Bessemer	$37.25	$37.25	$37.25	$36.15	$36.15	$36.37	$36.60	$36.60	$36.60	$36.60	$36.60	$36.60
Basic	33.95	33.95	33.95	32.95	32.95	33.17	33.40	33.40	33.40	34.40	34.40	34.40
Foundry No. 2	33.95	33.95	33.95	33.95	33.95	34.17	34.40	34.40	34.40	35.40	35.40	35.40
Malleable	34.45	34.45	34.45	34.45	34.45	34.67	34.90	34.90	34.90	35.90	35.90	35.90
Gray forge	32.95	32.95	32.95	32.95	32.95	33.17	33.40	33.40	33.40	34.40	34.40	34.40
FERROALLOYS:												
Ferrosilicon (50 per cent) del.	$175.00	$175.00	$177.50	$172.50	$170.00	$170.00	$165.00	$153.50	$150.00	$151.00	$150.00	$150.00
Ferrosilicon (10 per cent) fur.	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	57.00	57.00	57.00
SEMIFINISHED:												
Bessemer billets	$47.50	$47.50	$47.50	$47.50	$47.50	$47.50	$47.50	$47.50	$47.50	$47.50	$47.50	$47.50
Open-hearth billets	47.50	47.50	47.50	47.50	47.50	47.50	47.50	47.50	47.50	47.50	47.50	47.50
Bessemer sheet bars	51.00	51.00	51.00	51.00	51.00	51.00	51.00	51.00	51.00	51.00	51.00	51.00
Open-hearth sheet bars	51.00	51.00	51.00	51.00	51.00	51.00	51.00	51.00	51.00	51.00	51.00	51.00
Wire rods	57.00	57.00	57.00	57.00	57.00	57.00	57.00	57.00	57.25	57.50	57.50	57.50
COKE:												
Spot furnace	$6.00	$6.00	$6.00	$6.00	$6.00	$6.00	$6.00	$6.00	$6.00	$6.00	$6.00	$6.00
Contract furnace	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Spot foundry	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Contract foundry	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
ROLLED PRODUCTS:												
Structural shapes, base	3.00c	3.00c	3.00c	3.00c	3.00c	3.00c	3.00c	3.00c	3.00c	3.00c	3.00c	3.00c
Plates, base	3.25c	3.25c	3.25c	3.25c	3.25c	3.25c	3.25c	3.25c	3.25c	3.25c	3.25c	3.25c
Steel bars, base	2.90c	2.90c	2.90c	2.90c	2.90c	2.90c	2.90c	2.90c	2.90c	2.90c	2.90c	2.90c
Bar iron, base	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c
Shafting, discount	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00
Steel pipe, ¾ to 3 in., discount	51.00	51.00	51.00	51.00	51.00	51.00	51.00	51.00	51.00	51.00	51.00	51.00
Standard spikes	4.02c	3.90c	3.90c	3.90c	3.90c	3.90c	3.90c	3.90c	3.90c	3.90c	3.90c	3.90c
Hoops	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c
Bands	2.90c	2.90c	2.90c	2.90c	3.02c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c
Structural rivets	4.65c	4.65c	4.65c	4.65c	4.60c	4.40c	4.40c	4.40c	4.40c	4.40c	4.40c	4.40c
No. 28 black sheets	5.00c	5.00c	5.00c	5.00c	5.00c	5.00c	5.00c	5.00c	5.00c	5.00c	5.00c	5.00c
No. 28 galvanized sheets	6.25c	6.25c	6.25c	6.25c	6.25c	6.25c	6.25c	6.25c	6.25c	6.25c	6.25c	6.25c
No. 10 blue annealed sheets	4.25c	4.25c	4.25c	4.25c	4.25c	4.25c	4.25c	4.25c	4.25c	4.25c	4.25c	4.25c
Wire nails, base	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c
Plain wire, base	3.25c	3.25c	3.25c	3.25c	3.25c	3.25c	3.25c	3.25c	3.25c	3.25c	3.25c	3.25c
Tinplate	$7.75	$7.75	$7.75	$7.75	$7.75	$7.75	$7.75	$7.75	$7.75	$7.75	$7.75	$7.75
OLD MATERIAL:												
Heavy melting steel	$30.00	$30.00	$30.00	$29.00	$29.00	$29.00	$29.00	$29.00	$29.00	$29.00	$28.75	$28.00
Low phosphorus	42.20	40.00	40.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	38.60	38.50
No. 1 cast	28.00	28.00	28.00	34.00	32.50	32.50	32.50	32.50	32.50	32.50	32.40	32.00

Average Monthly Prices of Leading Materials at Chicago

PIG IRON:	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Lake Superior charcoal	$37.50	$37.50	$37.50	$37.50	$37.50	$37.50	$37.70	$37.70	$37.70	$38.70	$38.70	$38.70
Northern No. 2 foundry	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	34.00	34.00	34.00
Southern No. 2 foundry	37.50	37.50	37.50	37.50	37.50	37.75	38.50	38.50	38.50	40.25	40.25	40.25
Malleable	33.50	33.50	33.50	33.50	33.50	33.50	33.50	33.50	33.50	34.50	34.50	34.50
ROLLED PRODUCTS:												
Bar iron	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c
Steel bars	2.90	2.90	2.90	2.90	2.90	2.90	3.17	3.17	3.17	3.17	3.17	3.17
Structurals	3.00	3.00	3.00	3.00	3.00	3.00	3.27	3.27	3.27	3.27	3.27	3.27
Plates	3.25	3.25	3.25	3.25	3.25	3.25	3.52	3.52	3.52	3.52	3.52	3.52
Sheets No. 28 black	5.215	5.215	5.215	5.215	5.215	5.215	5.27	5.27	5.27	5.27	5.27	5.27
OLD MATERIAL:												
No. 1 R. R. wrought	$35.00	$35.00	$35.00	$35.00	$35.00	$35.00	$35.50	$33.50	$33.50	$33.50	$33.00	$29.00
Heavy melting steel	29.70	30.00	30.00	28.63	28.99	29.00	29.00	29.00	29.00	29.00	29.00	26.50
Rerolling rails	35.30	35.00	35.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	31.50
Car wheels	30.40	30.00	30.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	27.50

Average Monthly Prices of Leading Materials in the East

PIG IRON:	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Basic, eastern Pa.	$33.00	$33.00	$33.00	$32.00	$32.00	$32.00	$32.00	$32.00	$32.00	$36.60	$36.90	$36.90
No. 2X fdy., Philadelphia	34.25	34.25	34.25	34.25	34.25	34.25	34.25	34.50	34.50	38.85	39.15	39.15
No. 2X, Virginia, furnace	33.50	33.50	33.50	33.50	33.50	33.50	33.50	33.50	33.50	*37.50	*38.00	*38.00
Standard low phos., Philadelphia	55.50	55.50	55.50	55.50	55.50	55.50	56.00	56.00	56.00	57.00	57.00	57.00
Standard gray forge, east. Pa.	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	36.60	36.90	36.90
ROLLED PRODUCTS:												
Tank plates, base, Phila.	3.435c	3.435c	3.435c	3.435c	3.435c	3.435c	3.435c	3.48c	3.48c	3.48c	3.495c	3.495c
Structural shapes, base, Phila.	3.185c	3.185c	3.185c	3.185c	3.185c	3.185c	3.23c	3.23c	3.23c	3.23c	3.245c	3.245c
Steel bars, base, Philadelphia	3.085c	3.085c	3.085c	3.085c	3.085c	3.085c	3.13c	3.13c	3.13c	3.13c	3.145c	3.145c
Bar iron, common, base, Phila.	3.648c	3.50c	3.50c	3.50c	3.50c	3.685c	3.73c	3.73c	3.73c	3.73c	3.745c	3.745c
No. 10 blue anl. sheets, Phila.	4.435c	4.435c	4.435c	4.435c	4.435c	4.435c	4.48c	4.48c	4.48c	4.48c	4.495c	4.495c
Open-hearth billets, Phila.	$50.50	$50.50	$50.50	$50.50	$50.50	$50.50	$51.30	$51.30	$51.30	$51.30	$51.45	$51.50
OLD MATERIAL: (Delivered eastern Pennsylvania)												
No. 1 heavy melting steel	$29.80	$30.00	$29.50	$28.30	$28.50	$28.50	$28.50	$28.50	$28.50	$28.50	$28.00	$25.00
No. 1 R. R. wrought	35.00	35.00	35.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	33.50
No. 1 heavy cast	33.50	34.50	33.90	32.75	33.00	33.75	34.00	34.00	34.00	34.00	34.00	33.00

*Approximate.

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Denver—Denver Engineering Works
San Francisco—F. W. Grimwood, Rialto Bldg.

Average Monthly Prices of Leading Iron and Steel Products, 1907-1918

Finished Products in Net Tons. Pig Iron and Billets in Gross Tons

1918

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	34.00	34.00	34.00
Plates Chicago	65.00	65.00	65.00	65.00	65.00	65.00	70.40	70.40	70.40	70.40	70.40	70.40
Billets (Bess.) Pittsburgh	47.50	47.50	47.50	47.50	47.50	47.50	47.50	47.50	47.50	47.50	47.50	47.50
Bessemer Pig Pittsburgh	37.25	37.25	37.25	36.15	36.15	36.40	36.60	36.60	36.60	36.60	36.60	36.60
Basic Pig Pittsburgh	33.95	33.95	33.95	32.95	32.95	33.20	33.40	33.40	33.40	34.40	34.40	34.40
Beams Pittsburgh	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00
Bar Iron Cleveland	72.80	72.80	72.80	72.80	72.80	72.80	72.80	72.80	72.80	72.80	72.80	72.80
Steel Bars Pittsburgh	58.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00
No. 2 Foundry Birmingham	31.50	33.50	33.50	33.50	33.50	33.50	33.50	33.50	33.50	35.25	35.25	35.25

1917

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$30.00	31.23	35.70	39.23	43.20	51.00	55.00	55.00	49.50	33.00	33.00	33.00
Plates Chicago	79.60	78.80	91.80	93.80	109.80	158.40	192.80	192.00	146.60	65.00	65.00	65.00
Billets (Bess.) Pittsburgh	60.00	62.50	67.00	72.50	85.00	93.75	100.00	93.00	73.75	58.75	47.50	47.50
Bessemer Pig Pittsburgh	35.95	35.95	37.45	42.20	44.95	55.20	57.95	55.55	48.27	37.25	37.25	37.25
Basic Pig Pittsburgh	30.95	30.95	32.85	39.20	42.15	50.20	53.20	52.25	43.95	33.95	33.95	33.95
Beams Pittsburgh	61.50	65.00	69.20	74.00	80.00	80.00	90.00	90.00	75.00	60.00	60.00	60.00
Bar Iron Cleveland	60.00	60.00	60.00	65.00	65.00	70.00	90.00	95.00	90.00	90.00	78.80	73.00
Steel Bars Pittsburgh	59.40	60.00	64.20	67.80	70.00	72.40	77.00	80.00	74.40	58.00	58.00	58.00
No. 2 Foundry Birmingham	23.00	24.50	28.00	35.80	35.75	35.75	46.00	48.00	43.50	33.50	33.50	33.50

1916

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$18.50	18.50	18.70	19.00	19.00	19.00	19.00	19.00	18.65	19.15	25.00	29.25
Plates Chicago	41.00	47.00	55.00	59.00	62.00	62.00	62.00	63.00	64.00	64.00	69.20	75.00
Billets (Bess.) Pittsburgh	33.75	34.00	40.60	44.25	41.20	40.00	43.60	45.00	45.75	52.00	58.75	
Bessemer Pig Pittsburgh	21.32	21.45	21.55	21.95	21.95	21.95	21.95	21.95	22.20	24.33	30.35	35.95
Basic Pig, Pittsburgh	19.20	18.77	19.20	19.20	18.95	18.95	18.95	18.95	19.08	20.83	25.95	30.95
Beams Pittsburgh	37.20	40.60	48.00	50.00	50.00	50.00	50.00	50.00	52.00	54.00	57.60	60.50
Bar Iron Cleveland	40.00	45.80	48.00	48.00	48.00	48.00	48.00	48.00	48.00	51.00	54.00	60.00
Steel Bars, Pittsburgh	37.20	40.20	46.80	50.00	50.00	50.00	50.00	50.00	52.00	52.00	55.60	58.50
No. 2 Foundry Birmingham	14.50	14.63	15.00	15.00	15.00	14.45	14.00	13.60	14.38	15.13	19.60	23.00

1915

	Jan.	Feb	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	$13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.38	13.80	14.44	17.12	18.00
	25.60	25.40	26.80	25.60	25.80	26.20	27.80	28.80	29.80	31.10	35.80	19.40
	19.50	19.50	19.50	19.50	19.50	19.87	21.40	23.00	24.60	25.50	27.75	29.60
	14.70	14.63	14.55	14.55	14.55	14.58	14.88	15.89	16.80	16.95	17.45	19.85
	13.42	14.00	13.96	13.90	13.90	13.90	13.90	13.90	13.90	13.75	13.45	13.45
	22.00	22.00	23.00	23.00	24.00	24.00	25.00	26.00	26.80	28.10	32.50	16.00
	23.00	23.00	24.00	24.40	24.00	24.00	24.00	24.50	26.20	27.75	30.00	15.00
	22.00	22.00	23.00	24.00	24.00	24.00	25.20	26.00	26.80	28.20	32.50	14.80
$	9.50	9.50	9.38	9.35	9.75	9.56	9.60	11.00	11.30	11.75	13.12	14.20

1914

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$14.25	14.19	14.25	14.25	14.25	14.19	14.00	14.00	13.63	13.30	13.00	13.00
Gray Forge Cincinnati	12.75	12.75	12.87	12.75	12.75	12.69	12.30	12.25	12.25	12.25	11.90	11.40
Plates Chicago	26.60	27.35	27.60	26.36	25.80	25.60	25.60	27.35	27.35	26.04	25.00	24.00
Billets (Bess.) Pittsburgh	20.00	20.75	21.00	20.80	20.00	19.75	19.30	20.00	21.00	20.60	19.00	18.50
Bessemer Pig Pittsburgh	15.00	15.09	15.15	14.90	14.90	14.90	14.90	14.90	14.90	14.85	14.70	14.70
Beams Pittsburgh	24.00	24.00	24.00	23.60	23.00	22.38	22.20	23.50	24.00	23.50	22.20	21.00
Bar Iron Cleveland	26.00	26.00	24.75	24.60	24.00	24.00	24.00	24.00	24.00	24.00	23.75	23.00
No. 2 Foundry Birmingham	10.50	10.50	10.60	10.50	10.50	10.44	10.05	10.00	10.00	10.00	9.88	9.50

1913

	Jan.	Feb.	Mar	Apr.	May	June	July	Aug.	Sept	Oct.	Nov	Dec.
	$18.00	18.00	17.62	17.25	16.70	16.12	15.20	15.00	15.00	15.00	15.00	14.50
	15.75	15.25	15.25	14.25	13.50	12.75	12.75	12.75	13.25	13.25	13.00	13.25
	33.60	33.60	33.60	33.60	32.80	32.60	32.60	32.60	31.60	30.80	28.85	27.60
	28.20	28.87	29.00	29.00	27.37	26.50	26.50	26.12	25.00	23.00	20.87	20.00
	18.15	18.15	18.15	17.92	17.90	17.26	16.65	16.52	16.65	16.60	16.09	15.90
	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	28.25	27.40	26.00	25.00
$	33.00	33.00	33.00	33.00	32.50	32.00	31.20	29.25	28.25	27.40	27.00	26.00
$	13.70	13.50	13.00	12.50	11.75	10.60	10.50	11.00	11.00	11.00	10.75	11.00

1912

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$14.00	14.00	14.00	14.25	14.50	14.50	14.62	15.30	16.37	17.30	17.87	18.00
Gray Forge Cincinnati	12.50	12.50	12.50	12.50	12.85	13.00	13.50	13.90	14.75	15.70	16.18	15.75
Plates Chicago	26.00	25.76	25.90	27.55	28.60	28.60	29.60	30.40	31.35	32.60	33.60	33.60
Billets (Bess.) Pittsburgh	20.00	20.00	19.88	20.00	21.10	21.88	22.25	22.40	23.75	25.70	26.75	27.00
Bessemer Pig Pittsburgh	15.15	15.00	15.02	15.15	15.15	15.15	15.15	15.43	15.93	17.75	18.05	18.15
Beams Pittsburgh	23.00	23.00	23.00	23.40	25.00	25.00	26.00	27.40	28.60	28.60	29.00	29.00
Bar Iron Cleveland	24.00	23.50	23.50	24.00	24.40	25.25	27.00	27.25	29.00	30.20	31.00	31.00
No. 2 Foundry Birmingham	10.00	10.00	10.06	10.50	10.95	11.00	11.25	11.65	12.50	13.45	13.75	13.50

1911

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	$15.00	15.00	15.00	15.00	15.00	15.00	15.00	14.50	14.50	14.50	14.00	14.00
	13.35	13.25	13.15	13.05	12.90	12.50	12.05	12.05	12.05	12.00	12.00	12.00
	31.60	31.60	31.60	30.60	30.60	30.60	30.60	30.60	29.60	29.60	26.60	25.00
	23.00	23.00	23.00	23.00	23.00	21.00	21.00	21.00	21.00	20.00	19.70	19.25
	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.39	15.10	15.15
	28.00	28.00	28.00	28.00	28.00	27.00	27.00	27.00	26.40	24.00	22.60	23.25
	27.00	27.00	27.00	26.75	26.20	24.75	24.00	25.00	24.75	24.00	24.00	24.00
	11.00	11.00	11.00	11.00	10.75	10.25	10.00	10.05	10.10	10.00	9.75	10.00

1910

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$19.00	18.75	18.25	17.00	16.75	16.50	16.50	16.50	16.50	16.00	16.00	16.00
Gray Forge Cincinnati	16.50	16.38	15.75	14.88	14.56	14.35	14.12	13.75	13.75	13.75	13.75	13.75
Plates Chicago	35.60	35.60	34.60	33.60	33.60	32.60	31.60	31.60	31.60	31.60	30.60	30.60
Billets (Bess.) Pittsburgh	27.87	27.50	27.50	27.00	26.12	25.50	25.00	25.00	24.50	23.38	23.00	23.00
Bessemer Pig Pittsburgh	19.90	19.42	18.90	18.15	17.09	16.73	16.40	16.21	15.90	15.90	15.90	15.90
Beams Pittsburgh	31.00	31.00	30.40	30.00	30.00	29.20	28.20	28.00	28.00	28.00	28.00	28.00
Bar Iron Cleveland	33.00	33.00	33.00	32.50	31.00	30.10	28.00	28.00	28.00	28.00	27.80	27.00
No. 2 Foundry Birmingham	14.00	13.88	13.00	12.12	11.81	11.60	11.38	11.00	11.00	11.00	11.00	11.00

1909

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	$17.44	16.75	16.50	16.46	16.21	16.41	16.90	17.37	18.20	18.87	19.00	19.00
	14.75	14.62	13.50	13.25	13.31	13.50	13.95	14.62	15.25	16.62	16.75	16.75
	35.60	34.10	29.60	28.60	28.95	28.60	30.60	31.60	32.80	33.60	35.60	35.60
	25.00	23.50	23.00	22.00	22.50	23.00	24.00	25.00	26.00	26.50	27.50	27.50
	17.34	16.78	16.34	15.80	15.48	16.13	16.37	17.13	18.33	19.68	19.90	19.90
	32.00	29.00	26.00	24.00	25.00	26.00	27.00	28.00	30.00	30.00	31.00	32.00
	29.00	28.75	26.20	25.25	25.00	26.20	29.25	30.00	30.00	30.00	32.00	32.00
	13.00	12.70	11.75	11.00	11.00	11.31	12.30	13.00	14.00	14.50	14.50	14.00

1908

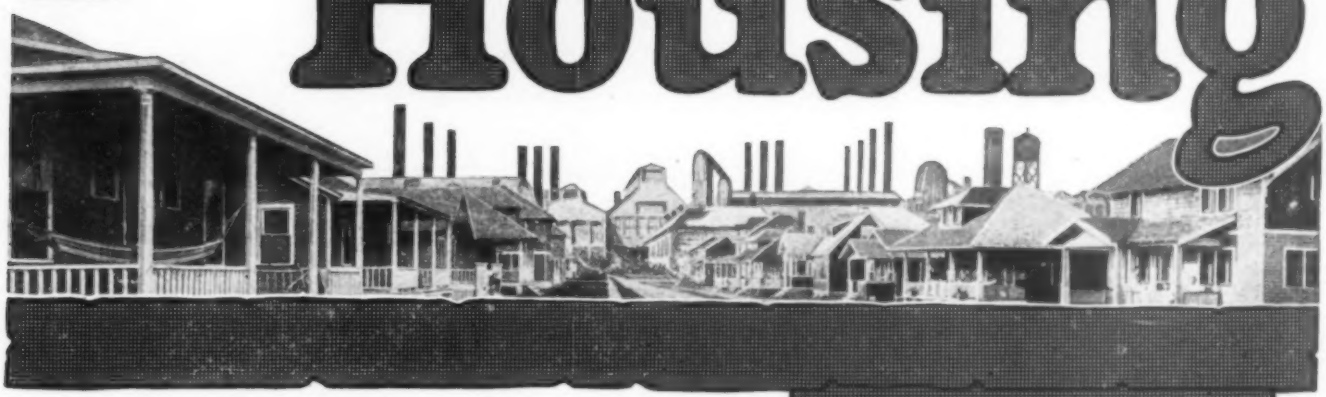
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. 2 Foundry Chicago	$18.24	17.87	17.42	17.21	17.00	17.31	17.00	17.00	16.75	16.50	16.75	17.35
Gray Forge Cincinnati	14.45	14.06	13.63	13.60	13.50	13.75	13.70	14.00	14.25	14.25	14.25	14.75
Plates Chicago	37.60	37.60	37.60	37.60	37.60	36.60	35.60	35.60	35.60	35.60	35.60	35.60
Billets (Bess.) Pittsburgh	28.00	28.00	28.00	28.00	28.00	26.50	25.00	25.00	25.00	25.00	25.00	25.00
Bessemer Pig Pittsburgh	19.00	17.90	17.86	17.49	16.92	16.90	16.73	16.11	15.90	15.48	16.74	17.40
Beams Pittsburgh	34.00	34.00	34.00	34.00	34.00	33.00	32.00	32.00	32.00	32.00	32.00	32.00
Bar Iron Cleveland	28.80	27.00	28.00	28.40	30.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00
No. 2 Foundry Birmingham	12.80	12.50	12.12	11.90	11.50	12.00	11.60	12.06	12.50	12.50	12.50	13.00

1907

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	$26.00	26.50	26.75	27.50	27.40	26.50	25.40	24.50	23.60	22.60	20.60	19.00
	22.60	22.50	22.70	21.50	21.90	21.35	20.55	19.95	18.85	18.45	17.35	15.50
	35.30	37.30	37.30	37.30	39.40	39.60	39.60	39.60	36.60	37.60	37.60	37.60
	29.75	29.50	29.25	29.75	30.25	31.00	30.00	29.50	28.50	28.00	28.00	28.00
	22.92	22.78	22.85	22.16	24.10	24.10	23.30	22.90	22.90	22.80	20.60	19.90
	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00
	39.00	36.50	36.00	36.00	35.00	34.00	34.00	33.00	33.00	32.50	31.00	31.00
	23.00	23.00	22.75	22.00	21.40	21.25	20.50	19.80	18.12	17.65	16.00	14.91

Charts based on above prices are published as a supplement of today's issue.

Industrial Housing



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Iron and Steel Prices

Corrected to Wednesday Noon

SCRAP, WAREHOUSE AND IRON ORE PRICES ON PAGE 128

Pig Iron

Bessemer, valley	$32.20
Bessemer, Pittsburgh	33.60
Basic, Pittsburgh	31.40
Basic, valley	30.00
Basic, delivered eastern Pa.	33.90
Basic, Buffalo, furnace	30.00
Malleable, Pittsburgh	32.90
Malleable, Chicago, furnace	31.50
Malleable, Buffalo, furnace	31.50
No. 1X, eastern delivered Phila.	37.90
No. 2, valley, Pittsburgh	32.40
No. 2 foundry, Cleveland furnace	31.00
No. 2 foundry, Ironton furnace	31.00
No. 1 foundry, Chicago furnace	32.25
No. 2 foundry, Chicago furnace	31.00
No. 2X, eastern del., Phila.	36.15
No. 2X, eastern, N. J. tidewater	36.55
No. 2X foundry, Buffalo furnace	32.25
No. 2 plain, del. Philadelphia	34.90
No. 2 plain, N. J. tidewater	35.30
No. 2 southern, Birmingham	32.25
No. 2 southern, Cincinnati	35.85
No. 2 southern, Chicago	37.25
No. 2 southern, Phila.	38.75
No. 2 southern, Cleveland	37.25
No. 2 southern, Boston	40.25
No. 2 southern, St. Louis	39.50
Virginia, No. 2X, furnace	34.50 to 35.50
Virginia, No. 2X, Phila.	38.75
Virginia, No. 2X, Jersey City	39.15
Virginia, No. 2X, Boston	40.25
Gray Forge, valley, Pittsburgh	30.40
Silveries, 8%, furnace	44.50
Ohio Silveries, 8%, Chicago	48.80
Tennessee Silveries, 8%, Chicago	49.50
Low phos. standard, Phila.	54.00
Low phos. Lebanon, furnace	48.00 to 50.00
Low phos. standard, Pittsburgh	51.40
Charcoal, Superior, Chicago	35.70 to 36.00
Charcoal, Superior, Buffalo	35.50
Charcoal, southern to 2 per cent silicon, furnace	48.00

Coke

(At the ovens)

Connellsville furnace	$6.00
Connellsville foundry	7.00
Pocahontas furnace	8.00
Pocahontas foundry	8.00
New River foundry	8.00
New River furnace	8.00
Wise county furnace	7.25
Wise county foundry	8.25

Ferroalloys

Ferromanganese, 70 per cent delivered	$225.00 to 230.00
Spiegel, 16 per cent fur., spot.	65.00 to 70.00
Spiegel, contracts, furnace	nominal
Ferrocarbon, titanium, carloads, maker's plant	200.00
Ferrosilicon, 50 per cent, spot and contract, delivered	142.50 to 145.00
Bessemer ferrosilicon, 10 per cent	54.00
Bessemer, ferrosilicon, 11 per cent	57.30
Bessemer ferrosilicon, 12 per cent	60.60

Ferrosilicon prices at Ashland, Ky., Jackson and New Straitsville, O.

Semifinished Material

BILLETS AND BLOOMS

Open-hearth, Pittsburgh	$43.50
Open-hearth, Philadelphia	47.50
Open-hearth, Youngstown	43.50
Bessemer, Pittsburgh	43.50
Bessemer, Youngstown	43.50
Forging, Pittsburgh	57.00
Forging, Philadelphia	60.00

SHEET BARS

Open-hearth, Pittsburgh	$47.00
Open-hearth, Youngstown	47.00
Bessemer, Pittsburgh	47.00
Bessemer, Youngstown	47.00

SLABS

Pittsburgh and Youngstown	$46.00

WIRE RODS AND SKELP

Wire rods, Pittsburgh	$57.00
Grooved skelp, Pittsburgh	2.70c
Sheared skelp, Pittsburgh	3.00c

Shapes, Plates and Bars

(In cents per pound)

Structural shapes, Pitts.	2.80c
Structural shapes, Phila.	3.045c
Structural shapes, N. Y.	3.07c
Structural shapes, Chgo.	3.27c
Tank plates, Chicago	3.52c
Tank plates, Pittsburgh	3.00c
Tank plates, Philadelphia	3.245c
Tank plates, New York	3.27c
Bars, soft steel, Pittsburgh	2.70c
Bars, soft steel, Chicago	3.17c
Bars, soft steel, New York	2.97c
Bars soft steel, Phila.	2.945c
Bar iron, common, Phila.	3.145c
Bar iron, common, Chicago	3.17c
Bar iron, refined, Chicago	4.67c
Bar iron, common, Cleveland	3.07c
Bar iron, common, New York	3.57c
Bar iron, common, Pittsburgh	2.90c
Bar iron, refined, Pittsburgh	4.40c
Hard steel bars, Chicago	3.00c

Rails, Track Material

Angle bars, Pittsburgh base	3.00c
Angle bars, Chicago base	3.00c
Standard bessemer rails, mill	$55.00
Stand. open-hearth rails, mill	57.00
Light rails, 25 to 45, mill	2.75c
Relaying rails, light, St. L.	50.00 to 55.00
Spikes, railroad, Pitts.	3.65c
Track bolts, Pittsburgh	4.65c
Track bolts, Chicago	4.92c
Tie plates, Chicago	3.00c

Wire Products

(Per 100 lbs. to jobbers; retailers 5c more)

Wire nails, Pittsburgh	$3.50
Coated nails, Pittsburgh	3.45
Plain wire, Pittsburgh	3.25
Galvanized wire, Pittsburgh	3.95
Polished staples, Pittsburgh	3.65
Galvanized staples, Pittsburgh	4.35
Barb wire, painted, Pitts.	3.65
Barb wire, galvanized, Pitts.	4.35
Cut nails, Pittsburgh	5.00

Chain, Piling, Strip Steel

(In cents per pound)

Chain, 1 in. proof coil, Pitts.	7.50c
Sheet piling, base, Pitts.	4.00c to 5.00c

Cold rolled strip steel, hard coils, 1⅛ inches and wider by 0.100 inch and heavier, base per 100 pounds, 6.25c.

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Sheets

(In cents per pound)

SHEET MILL BLACK

No. 28, open-hearth, Pitts.	4.70c
No. 28, bessemer, Pitts.	4.70c
No. 28, open-hearth, Chi.	4.97c

TIN MILL BLACK

No. 28, open-hearth, Pitts.	4.70c
No. 28, bessemer, Pitts.	4.70c

GALVANIZED

No. 28, open-hearth, Pitts.	6.05c
No. 28, bessemer, Pitts.	6.05c
No. 28, open-hearth, Chi.	5.25c

BLUE ANNEALED

No. 10, open-hearth, Pitts.	3.90c
No. 10, bessemer, Pitts.	3.90c
No. 10, open-hearth, Chi.	4.25c
No. 10, open-hearth, Phila.	4.145c

Tin Plate

(Per 100 lb. box)

Tin plate, coke base, Pitts.	$7.35

Iron and Steel Pipe

Base Pittsburgh

Base, Pittsburgh		Black Per cent off	Galv. Per cent off
⅜ to 3 in., butt, steel		54	40½
⅜ to 3 in., butt, iron		36	20

Boiler Tubes

Steel, 3½ to 4½ inches, l. c. l.	30
Iron, 3½ to 4½ inches, c. l.	12½

Cast Iron Water Pipe

Without War Freight Tax

(Class B Pipe)

Class A pipe is $1 higher than Class B.

Four-inch, Chicago	69.80
Six-inch and over, Chicago	66.80
Four-inch, New York	70.70
Six-inch and over, N. Y.	67.70
Four-inch, Birmingham	63.00
Six-inch and over, Birmingham	60.00

Hoops, Bands, Shafting

Hoops, Pittsburgh	3.30c
Bands, Pittsburgh	3.30c
Hot rolled strip steel, Pitts.	3.30c
Hot rolled strip steel, Pitts. stamping quality	3.80c
Shafting, Pitts., carloads	21 off to list
Cotton ties, per bundle	nominal

Rivets

Structural rivets, Pittsburgh	4.40c
Boiler rivets, Pittsburgh	4.50c
Rivets ⅞ in. and small., Pitts.	50 and 10 off

Nuts and Bolts

(Prices f. o. b. Pittsburgh)

CARRIAGE BOLTS

(⅝ x 6 inches, smaller and shorter)

Rolled thread	50-5 off
Cut thread	40-10-5 off
Larger and longer	40 off

MACHINE BOLTS

(⅝ x 4 inches, hot pressed nuts)

Rolled thread	50-10-5 off
Cut thread	50-5 off
Larger and longer	40-10 off
Cold pressed semifinished hexagon nuts ⅝ in. and larger	60-10-10 off
Cold pressed semifinished hexagon nuts ½ in. and smaller	70-5 off
Gimlet and cone point lag screws	50-10 off

NUTS

Hot pressed, square blank	2.50c off
Hot pressed, square tapped	2.30c off
Hot pressed, hexagon blank	2.30c off
Hot pressed, hexagon tapped	2.10c off
Cold pressed, square blank	2.25c off
Cold pressed, square tapped	2.00c off
Cold pressed, hexagon blank	2.25c off
Cold pressed, hexagon tapped	2.00c off

Takes a long time to wear out Steel-Grip Industrial Gloves and Mittens—

We asked the man who wore the gloves shown in the picture, "How long have you worn them?" He said "About a month". "How long do gloves without the reinforcement wear you?" we asked. "About a day." "And suppose you were to wear canvas gloves—how long would they wear?" we asked. "They wouldn't last ten minutes," was the reply—"an I would lose part of my hide in the bargain."

Where work is rough and hard on hands you can't beat the protection and the economy of Steel-Grip Gloves.

Better Protection at Less Cost

The value of Steel-Grip Gloves is very apparent. They are made of chrome leather. This tough leather is reinforced with steel ribbons. Some of the gloves have extra palms—*three wearing surfaces* where the hard wear comes. The seams are sewed with steel. They're rip-proof and well nigh wear proof. The longest lasting gloves ever produced.

The concerns listed below and a hundred more just as big, are using Steel-Grip Gloves right along. Why? Because they are GIVING PERFECT HAND PROTECTION AND PROVING ECONOMICAL ON A DOLLAR AND CENTS BASIS. Try them and you will keep on buying them. A few leading styles are pictured Complete illustrated price list gladly furnished on request.

Hickory Steel-Grip Glove Co.

Box R-6 - - - Chicago, Ill.

Notice who use them

A few of our hundreds of users:

American Steel Foundries
Crane Company
General Electric Company
Malleable Iron Fittings Company
National Malleable Castings Company
Ohio Steel Foundry Company
Otis Elevator Company
Shaw Electric Crane Company
Standard Steel Casting Company
Stanley Works
Timken-Detroit Axle Company

No. 678—Can be worn on either hand. No reinforcement. Closed with steel thread. $8.40 per dozen pairs (24 mittens).

No. 681—Reinforced with steel ribbons over strips of tough leather. Closed with steel thread. Price $12 per dozen pairs (or all lefts or all rights).

No. 605—Short Glove. Reinforced with extra leather patch on palm and steel ribbons. Steel sewed. Price $10.20 per dozen pairs (or all lefts or all rights).

No. 644—Reinforced with steel ribbons over strips of tough leather. Closed with steel thread. Especially adapted for sandblasting, handling castings, gears, belts, sheet metal, etc. Price $15 per dozen pairs (or all lefts or all rights).

Iron and Steel Prices

Corrected to Wednesday Noon

Iron Ore

Superior Ores, Per Ton, Lower Lake Ports	
Old range Bessemer, 55 iron	$6.65
Mesabi Bessemer, 55 iron	6.40
Old range non-Bess., 51½ iron	5.90
Mesabi non-Bess., 51½ iron	5.75

Warehouse Prices

Steel bars, Chicago	4.17c
Steel bars, Cleveland	4.07c
Steel bars, Detroit	4.13c
Steel bars, Philadelphia	4.145c
Steel bars, New York	4.17c
Steel bars, St. Louis	4.24c
Steel bars, Cincinnati	4.13c
Steel bars, St. Paul	4.395c
Steel bars, Buffalo	3.905c
Iron bars, Buffalo	4.70c
Iron bars, Chicago	4.77c
Iron bars, Cleveland	4.67c
Iron bars, Detroit	4.75c
Iron bars, St. Louis	4.84c
Iron bars, Cincinnati	4.13c
Iron bars, Philadelphia	4.745c
Iron bars, News York	4.77c
Shapes, Chicago	4.27c
Shapes, Detroit	4.23c
Shapes, St. Louis	4.34c
Shapes, St. Paul	4.495c
Shapes, New York	4.27c
Shapes, Cleveland	4.17c
Shapes, Philadelphia	4.245c
Shapes, Buffalo	4.015c
Shapes, Cincinnati	4.23c
Plates, Buffalo	4.215c
Plates, Chicago	4.52c
Plates, Detroit	4.48c
Plates, St. Louis	4.59c
Plates, St. Paul	4.745c
Plates, New York	4.52c
Plates, Cleveland	4.42c
Plates, Philadelphia	4.495c
Plates, Cincinnati	4.48c
No. 10 blue anl. sheets, Chicago	5.52c
No. 10 blue anl. sheets, Cleveland	5.42c
No. 10 blue anl., Buffalo	6.165c
No. 10 blue anl. sheets, St. L.	5.59c
No. 10 blue anl. sheets, Cincinnati	5.48c
No. 10 blue anl. sheets, St. Paul	5.745c
No. 10 blue anl. sheets, Detroit	5.48c
No. 28 black sheets, Chicago	6.52c
No. 28 black sheets, Cleveland	6.42c
No. 28 black sheets, Cincinnati	6.48c
No. 28 black, Detroit	6.48c
No. 28 black sheets, St. L.	6.59c
No. 28 black sheets, St. Paul	6.745c
No. 28 black Buffalo	6.165c
No. 28 galv. sheets, Chicago	7.77c
No. 28 galv. sheets, Cleveland	7.67c
No. 28 galv. sheets, Cincinnati	7.73c
No. 28 galvanized, Detroit	7.73c
No. 28 galv. sheets, St. L.	7.84c
No. 28 galv. sheets, Buffalo	7.515c

Iron and Steel Scrap

(Prices in Gross Tons)

STEEL WORKS USE

Bundled sheets, Cincinnati	$23.00 to 24.00
Bundled sheets, Pittsburgh	24.00 to 25.00
Bundled sheets, Cleveland	22.00 to 23.00
Bundled sheets, Buffalo	20.00 to 21.00
Boiler plate, cut, No. 1, Chicago	18.00 to 19.00
Boiler plate, cut, No. 1, St. Louis	16.50 to 17.00
Frogs, switches, guards, St. Louis	26.00 to 26.50
Frogs, switches, guards, Chicago	24.00 to 25.00
Heavy melting steel, Pittsburgh	26.00 to 27.00
Heavy melting steel, Buffalo	23.00 to 24.00
Heavy melting steel, Chicago	24.00 to 25.00
Heavy melting steel, Cleveland	25.00 to 25.50
Heavy melting steel, Cincinnati	25.00 to 26.00
Heavy melting steel, east. Pa.	22.00 to 23.00
Heavy melting steel, N. Y.	17.00 to 18.00
Heavy melting steel, St. L.	25.50 to 26.00
Heavy melting steel, Birmingham	21.00 to 22.00
Baled sheets, Cleveland	26.00 to 26.50
Baled sheets, Pittsburgh	25.00 to 26.00
Baled sheets, Chicago	23.00 to 24.00
Knuckles, couplers, Chicago	28.00 to 29.00
Knuckles, couplers, St. Louis	28.00 to 28.50
Low phos. steel, Buffalo	29.00 to 30.00
Low phos. steel, Pittsburgh	34.00 to 35.00
Low phos. crops, eastern Pa.	nominal
Low phos. guaranteed E. Pa.	nominal
Shoveling steel, Chicago	24.50 to 25.00
Shoveling steel, St. Louis	24.00 to 24.50
Steel rails, short, Cleveland	26.00 to 26.50
Steel rails, short, Chicago	27.00 to 28.00
Steel rails, short, St. Louis	26.00 to 26.50
Steel rails, old, Birmingham	24.00 to 25.00
Stove plate, Chicago	20.50 to 21.50
Stove plate, Cincinnati	19.00 to 19.50
Stove plate, St. Louis	18.00 to 18.50
Stove plate, N. J. points	18.50
Stove plate, Birmingham	18.00 to 19.00
Stove plate, Buffalo	25.00 to 26.00
Stove plate, eastern Pa.	25.50 to 26.50
Stove plate, Cleveland	20.00 to 21.00
Stove plate, Pittsburgh	24.00 to 25.00

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:

Cleveland	$1.40
Newark, N. J.	4.80
Boston	5.20
Philadelphia	4.40
Pittsburgh	1.40
St. Louis	4.60
Minneapolis, St. Paul	5.70
Buffalo to:	
Albany, N. Y.	$1.75
New England (rail)	3.90
New York and Brooklyn (rail)	3.90
Virginia furnaces to:	
Philadelphia	$4.10
New England	4.70
Brooklyn, Jersey City, Newark	4.40
Birmingham, Ala., to:	
Boston	$8.00
Cincinnati	3.60
Chicago	5.00
Cleveland	5.00
Louisville, Ky.	3.30
Minneapolis, St. Paul	7.30
New York	7.70
Philadelphia	6.50
Pittsburgh	5.70
Savannah, Ga.	3.40
St. Louis	4.25
Chicago to:	
Des Moines	$3.50
Minneapolis, St. Paul	2.50
Milwaukee	.60
Moline, Ill.	1.40
Omaha	4.50
St. Louis	1.90
Ironton and Jackson, O., to:	
Chicago	$3.80
Cincinnati	1.80
Cleveland	2.40
Detroit	2.60
Indianapolis	2.30
Minneapolis, St. Paul	5.70

Freight Rates, Finished Material

Pittsburgh, carloads, per 100 lbs., to:

New York	27.0 cents
Philadelphia	24.5 cents
Boston	30.0 cents
Buffalo	21.5 cents
Baltimore	23.0 cents
Cleveland	17.0 cents
Cincinnati	23.0 cents
Chicago	27.0 cents
Detroit	23.0 cents
Minneapolis and St. Paul	49.5 cents
Denver	$1.09
St. Louis	33.5 cents
New Orleans	38.5 cents
Birmingham	57.5 cents
Pacific coast (all rail)	$1.25
Pacific coast (tin plate)	1.25

IRON MILL USE

Busheling, No. 1, Cleveland	25.00
Busheling, No. 1, Buffalo	20.00 to 21.00
Busheling, No. 1, Pittsburgh	25.00 to 26.00
Busheling, No. 1, Cincinnati	26.00 to 26.50
Busheling, No. 1, Chicago	25.00 to 26.00
Busheling, No. 2, Chicago	16.00 to 17.00
Busheling, No. 1, St. Louis	25.00 to 26.00
Cast borings, New York	12.75 to 13.25
Cast borings, eastern Pa.	15.50 to 16.50
Cast borings, Buffalo	16.00 to 17.00
Cast borings, Cleveland	16.00 to 16.50
Cast borings, Cincinnati	14.50 to 15.00
Cast borings, Pittsburgh	17.50 to 18.00
Cast borings, Birmingham	16.00 to 17.00
Cast borings, Chicago	14.50 to 15.00
Cast borings, St. Louis	14.50 to 14.50
City wrought, long, N. Y.	27.00 to 27.50
Cut forge, Chicago	26.00 to 27.00
Forge No. 1, eastern Pa.	23.00 to 24.00
Forge flashings, large, Cleveland	25.00
Forge flashings, small, Cleveland	25.50 to 26.50
Grate bars, Buffalo	23.00 to 24.00
Grate bars, Cleveland	21.00 to 21.50
Grate bars, N. J. points	18.50
Iron axles, Pittsburgh	nominal
Iron axles, Cincinnati	43.00 to 44.00
Iron axles, Cleveland	38.00
Iron axles, Chicago	40.00
Iron axles, eastern Pa.	nominal
Iron axles, St. Louis	38.00 to 38.50
Iron axles, Buffalo	36.00 to 37.00
Iron rails, Chicago	33.00 to 34.00
Iron rails, Buffalo	30.00 to 31.00
Iron rails, Cincinnati	33.00 to 34.00
Iron rails, St. Louis	33.50 to 34.00
Iron rails, Cleveland	35.00
Machine turnings, Cleveland	15.50 to 16.00
Machine turnings, Cleveland	15.50 to 16.00
Machine turnings, Buffalo	15.00 to 16.00
Machine turnings, N. Y.	12.75 to 13.25
Machine turnings, Pittsburgh	15.00 to 16.00
Machine turnings, east. Pa.	16.00 to 17.00
Machine turnings, Birmingham	16.00 to 17.00
Machine turnings, Chicago	12.50 to 13.00
Machine shop turnings, St. Louis	14.50 to 15.00
Pipes and flues, Cleveland	24.50 to 25.00
Pipes and flues, Chicago	20.50 to 21.50
Pipes and flues, St. Louis	18.50 to 19.00
R. R. mach. cast, No. 1, Buffalo	31.00 to 32.00
R. R. wgt. No. 1, Buffalo	27.00 to 28.00
R. R. wrgt. No. 1, east. Pa.	nominal
Railroad wrgt., No. 1, Cincinnati	30.00 to 31.00
Railroad wrgt., No. 1, Cleveland	29.00 to 29.50
R. R. wrought, No. 1, Pittsburgh	32.00 to 33.00
Railroad wrgt., No. 2, Chicago	26.00 to 27.00
Railroad wrought, No. 1, Chicago	27.50 to 28.50
R. R. wrought, No. 1, Birmingham	23.00 to 24.00
No. 1 yard wrought, eastern Pa.	29.00 to 30.00
No. 1 bushelings wrgt., east. Pa.	30.00
Sheet wrought, Pittsburgh	32.00 to 33.00
Railroad wrgt., No. 1, St. Louis	27.00 to 27.50
Railroad wrought, No. 2	26.00 to 26.50
Wrought pipe, Buffalo	21.00 to 22.00
Wrought pipe, east. Pa.	29.00 to 30.00
Wrought pipe, ungraded, east. Pa.	20.00 to 21.00

IRON OR STEEL WORKS USE

Axle turnings, Cleveland	$22.00
Axle turnings, Buffalo	19.00 to 20.00
Heavy axle turnings, east. Pa.	23.00
Heavy axle turnings, Pitts.	20.00 to 21.00
Shafting, New York	32.00
Shafting, east. Pa.	31.00 to 32.00
Shafting, St. Louis	30.00 to 31.00
Steel car axles, Birmingham	30.00 to 32.50
Steel car axles, Pittsburgh	46.50
Steel car axles, New York	30.00 to 31.00
Steel car axles, Buffalo	35.00 to 38.00
Steel car axles, Cleveland	38.00 to 39.00
Steel car axles, East. Pa.	nominal
Steel car axles, Chicago	37.50 to 38.50
Steel car axles, St. Louis	37.00 to 38.00

IRON FOUNDRY USE

Car wheels (iron), Pittsburgh	$29.00
Car wheels (steel), Pittsburgh	34.00 to 35.00
Car wheels, East. Pa.	nominal
Car wheels, Buffalo	27.00 to 28.00
Car wheels, Chicago	25.00 to 26.00
Car wheels, St. Louis	28.50 to 29.00
Car wheels, Birmingham	22.00 to 23.00
Car wheels, Cleveland	26.50
Tram car wheels, Birmingham	21.00 to 22.00
Cast, No. 1, Birmingham	23.00 to 24.00
Cast, No. 1, cupola, east. Pa.	31.00 to 32.00
Cast, No. 1, Cleveland	28.00 to 28.50
Cast, No. 1, Cincinnati	29.00 to 29.50
Cast, 1, machy., New York	25.00 to 26.00
Cast, 1, heavy, New York	25.00 to 26.00
Cast, No. 1, Chicago	29.00 to 30.00
Cast, No. 1, Pittsburgh	30.00 to 31.00
Cast, No. 1, St. Louis R. R.	25.00 to 25.50
Malleable, Cincinnati	27.00 to 27.50
Malleable, Cleveland	30.00
Malleable, Buffalo	29.00 to 30.00
Malleable, Pittsburgh	29.00 to 30.00
Malleable, East, Pa.	nominal
Malleable, cupola, East. Pa.	nominal
Malleable, railroad, Chicago	27.00 to 28.00
Malleable, agricultural, Chicago	24.50 to 25.50
Malleable, railroad, St. Louis	22.00 to 22.50
Malleable, agricultural, St. Louis	18.00 to 18.50

MISCELLANEOUS USES

Boiler punchings, Chicago	32.00 to 33.00
Reroll. rails, 5 ft. and over, Pitts.	32.00 to 33.00
Reroll. rails, 5 ft. and over, Chi.	27.50 to 28.00
Reroll. rails, 5 ft. and over, E. Pa.	nominal
Reroll. rails, 5 ft. and over, St. L.	27.00 to 27.50
Reroll. rails, 5 ft. or over, Cleve.	29.00 to 29.50
Rerolling rails, long, Birmingham	37.50 to 38.50
Locomotive tires, Chicago	33.00 to 34.00
Locomotive tires, St. Louis	23.00 to 23.50